

(12) UK Patent Application (19) GB (11) 2 364 614 (13) A

(43) Date of A Publication 30.01.2002

(21) Application No 0121352.9

(22) Date of Filing 05.11.1999

Date Lodged 04.09.2001

(30) Priority Data

(31) 98047596

(32) 06.11.1998

(33) KR

(31) 98051621

(32) 28.11.1998

(31) 98051622

(32) 28.11.1998

(31) 98051623

(32) 28.11.1998

(31) 98051624

(32) 28.11.1998

(31) 99041178

(32) 20.09.1999

(62) Divided from Application No 9926190.1 under Section 15(4) of the Patents Act 1977

(51) INT CL⁷

H04M 1/02

(52) UK CL (Edition T)

H4J JK J36Q J36R

(56) Documents Cited

WO 98/27712 A2

WO 95/35622 A1

(58) Field of Search

UK CL (Edition R) H3Q QACA QACX , H4J JAAB JK
INT CL⁷ A44C 5/00 , H04B 1/08 1/38 , H04M 1/02 1/03
1/21 1/62 1/72

ONLINE: WPI, EPODOC, JAPIO

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(54) Abstract Title

Wristwatch type mobile phone having battery pack locking mechanism

(57) The wrist watch type portable radiotelephone comprises a body element 10 including upper 110 and lower 112 case frames; a battery pack holder 20 including a battery pack 22 for supplying power to the body element; locking means (50, fig.2) for locking and unlocking the battery pack to and from the battery pack holder; hinge means 30 for rotatably connecting the body element and the battery pack holder with each other; and a wrist band 40 connected to the body element and the battery pack holder for enabling the portable radiotelephone to be worn around the wrist.

The locking means comprised a guide slot (257, fig.15) a locker (51, fig.15) and a sub-locker (52, fig.15), so hereby the locker is connected to the sub-locker by a screw, and the sub-locker has a locking end (524, fig.15) which engages with a locking groove defined in the battery pack (226, fig.16).

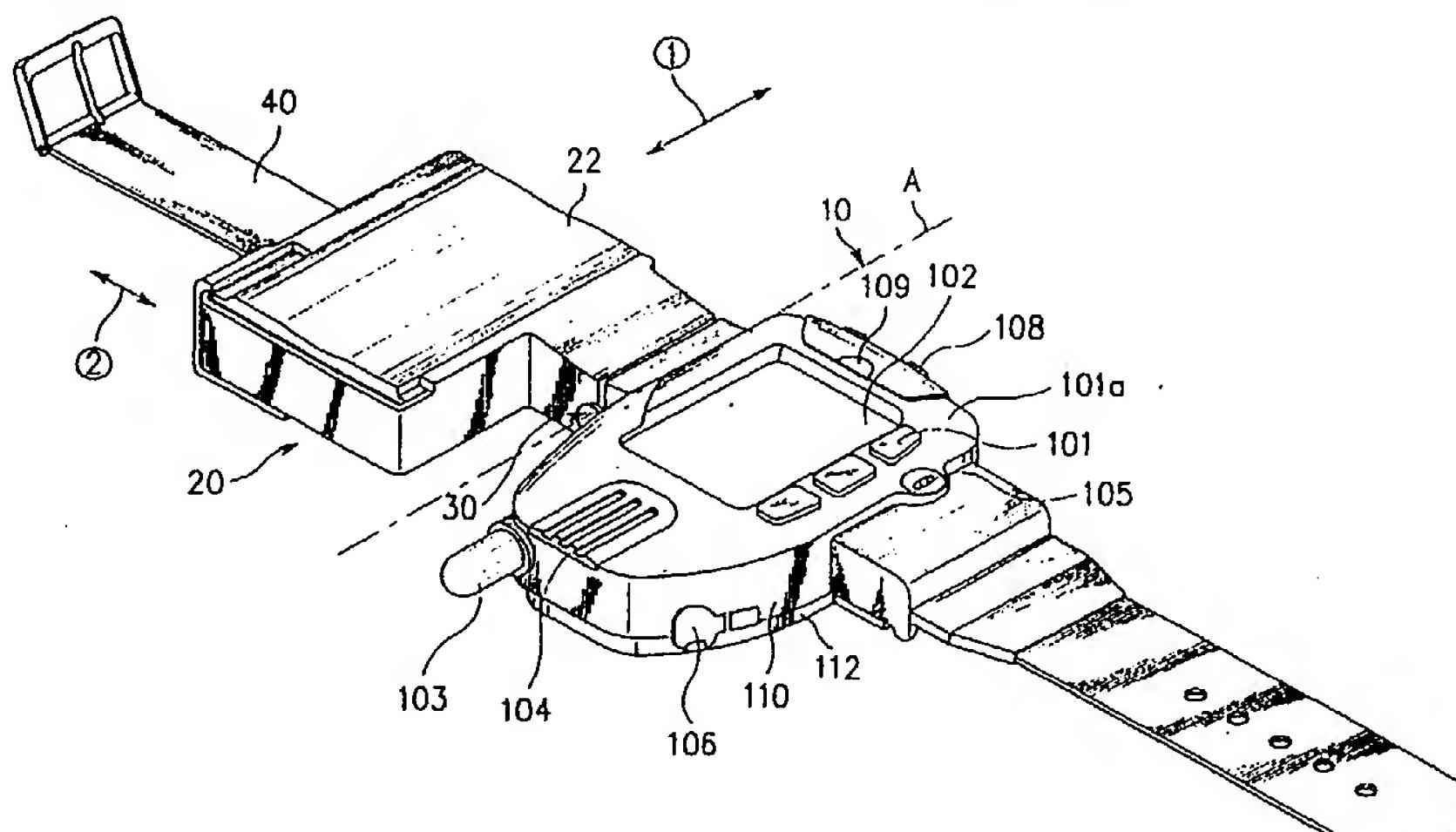


FIG. 1

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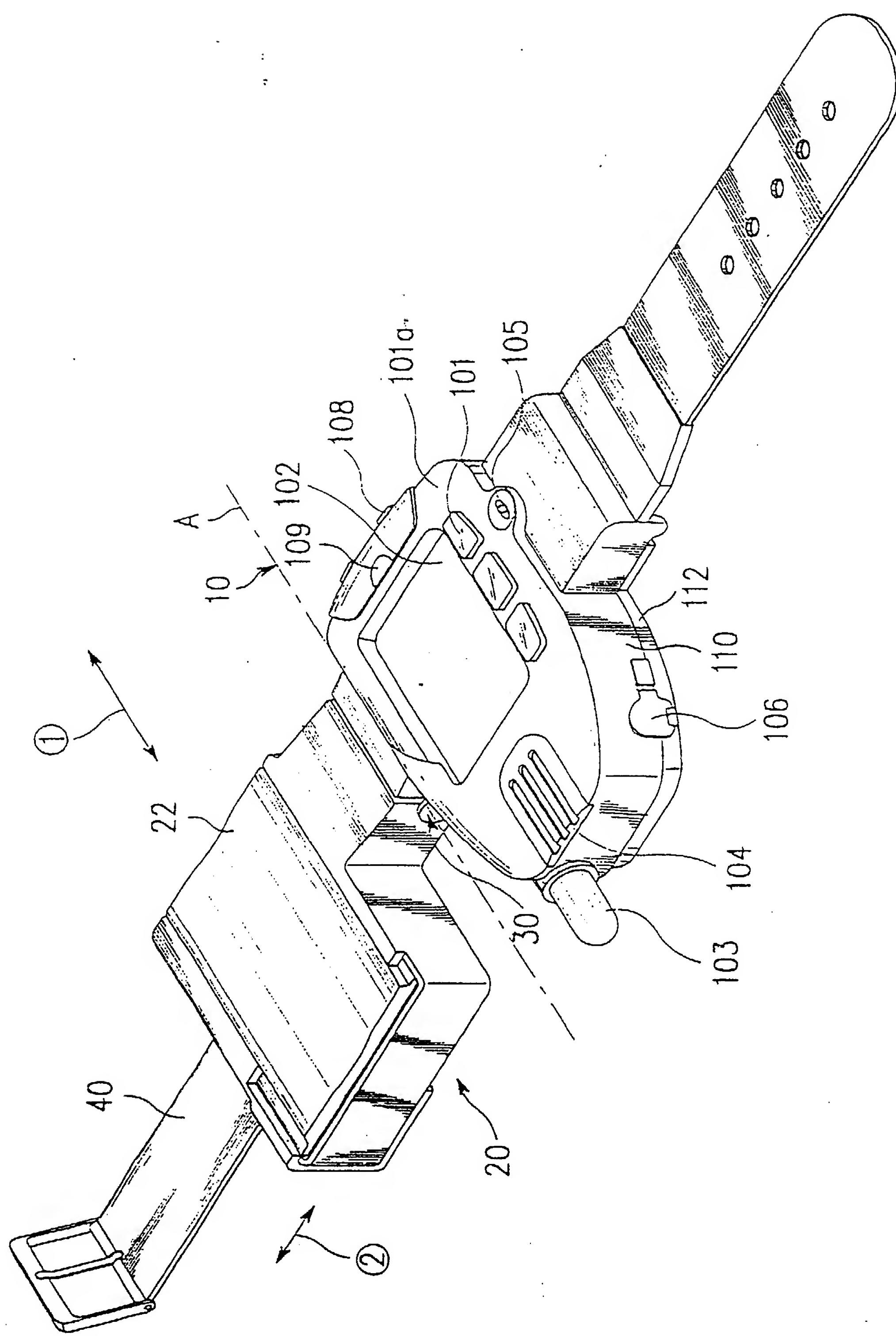


FIG. 1

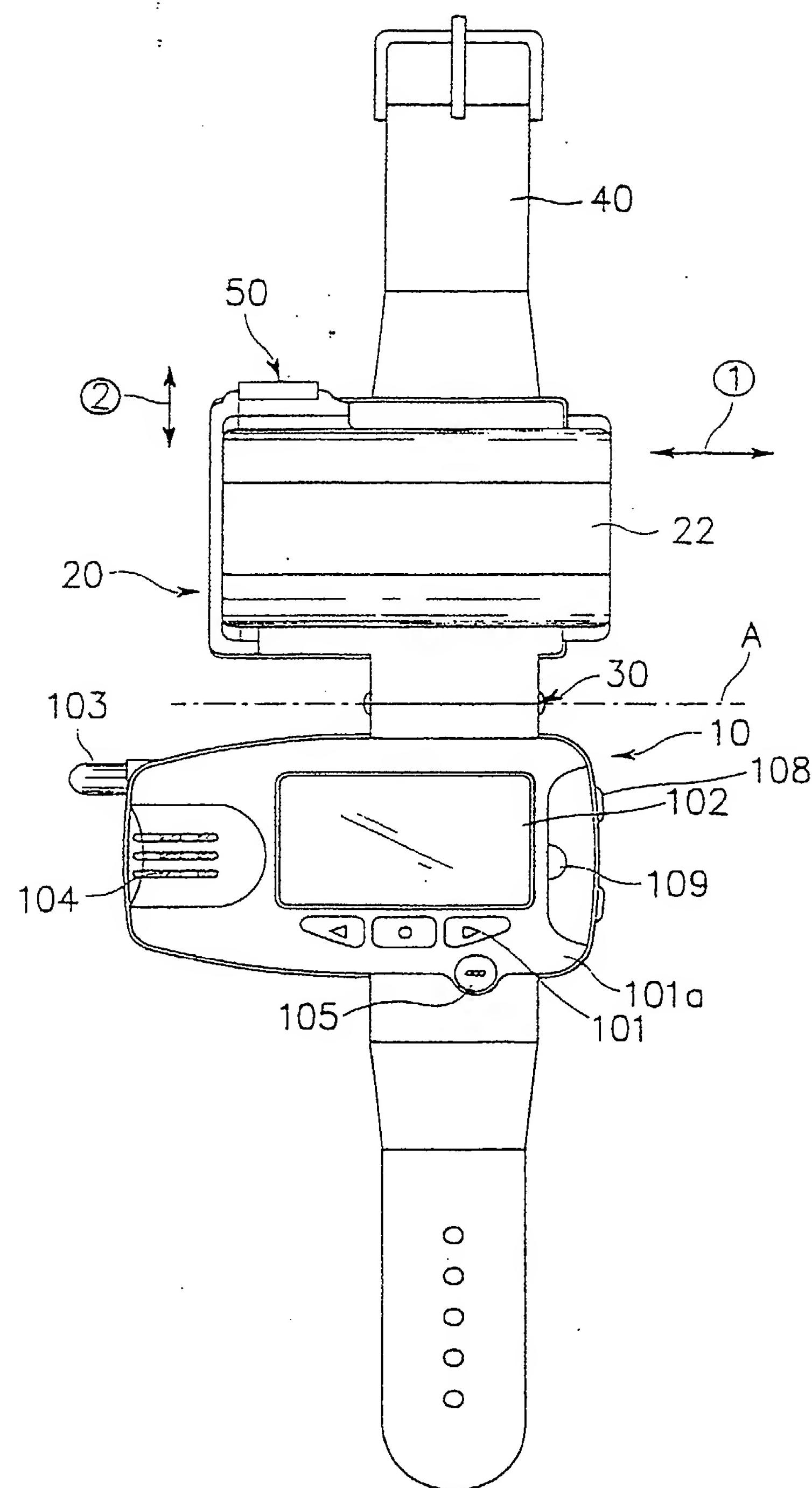


FIG. 2

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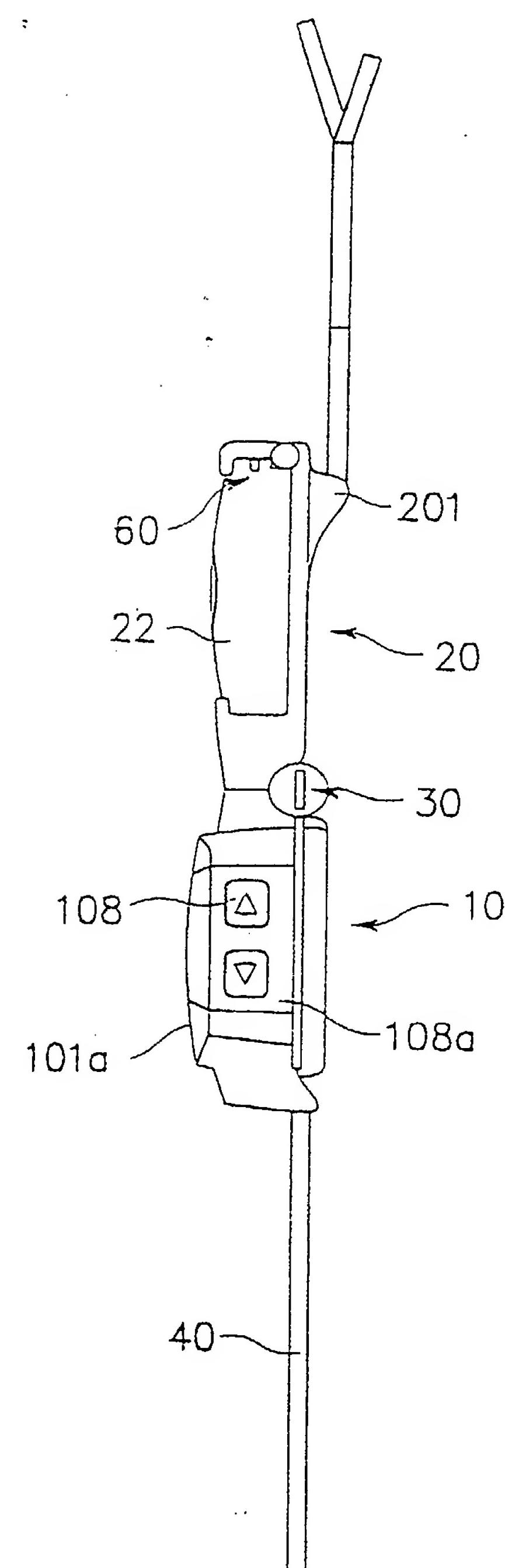


FIG. 3

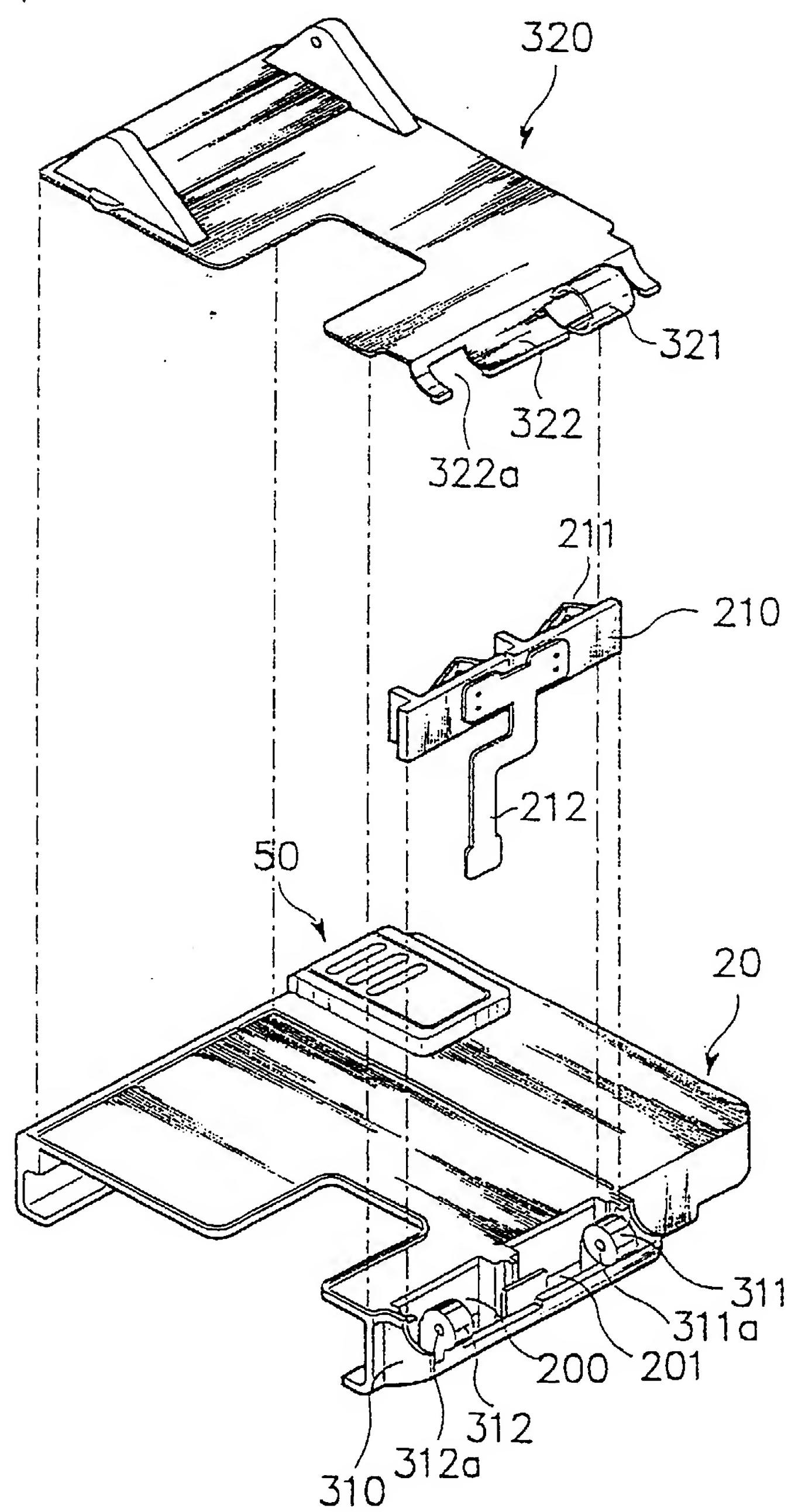


FIG. 4

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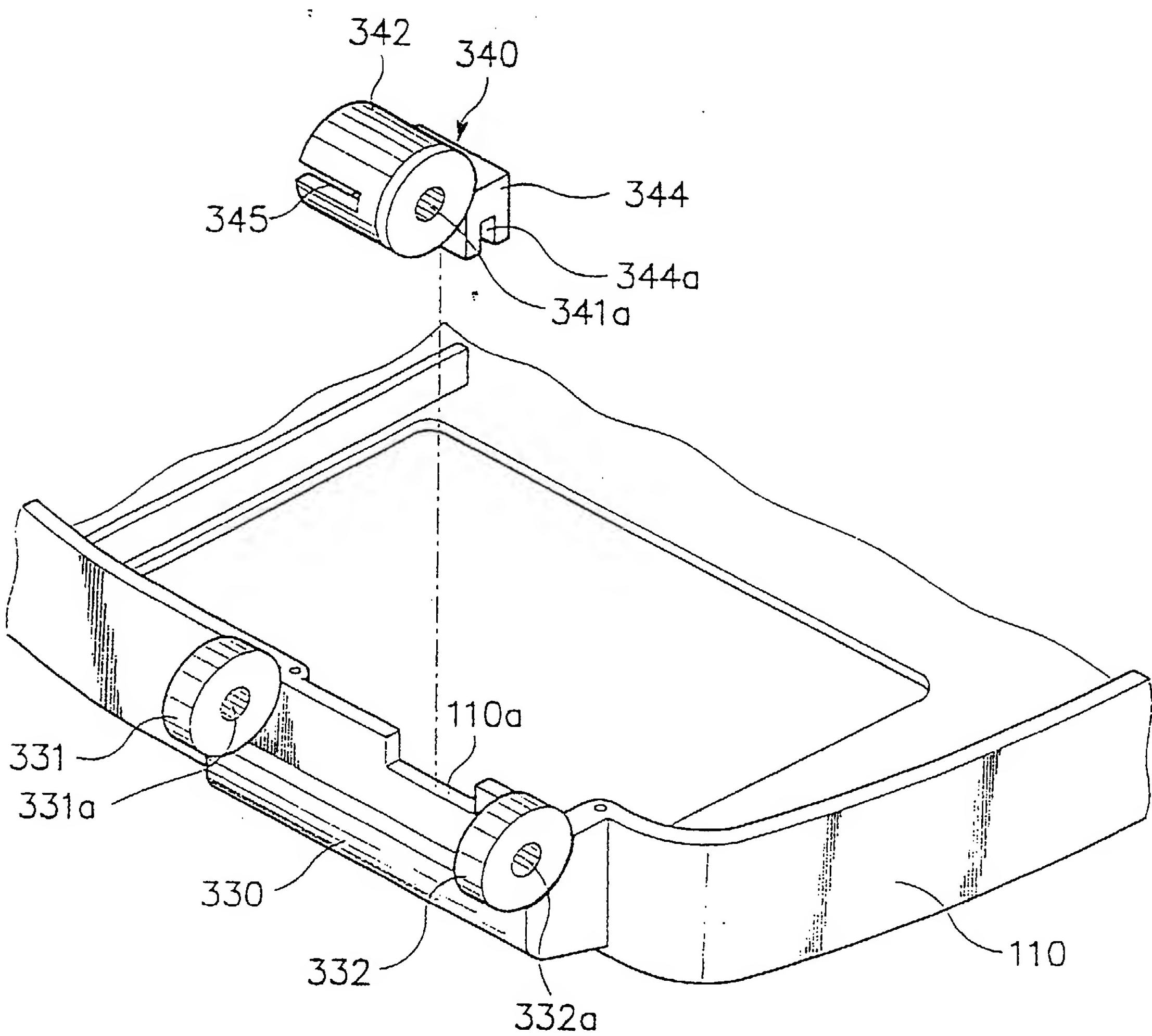
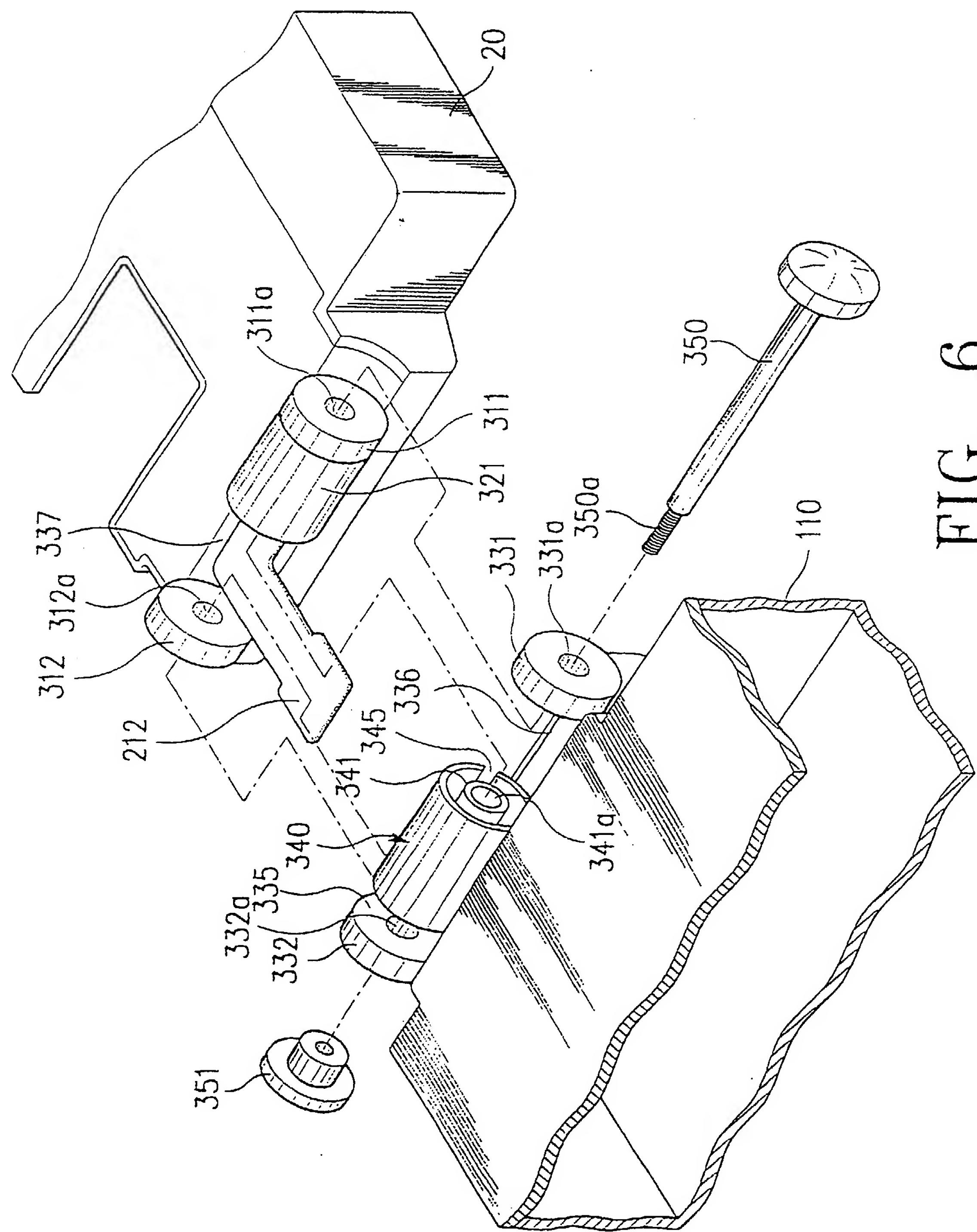


FIG. 5

FIG. 6



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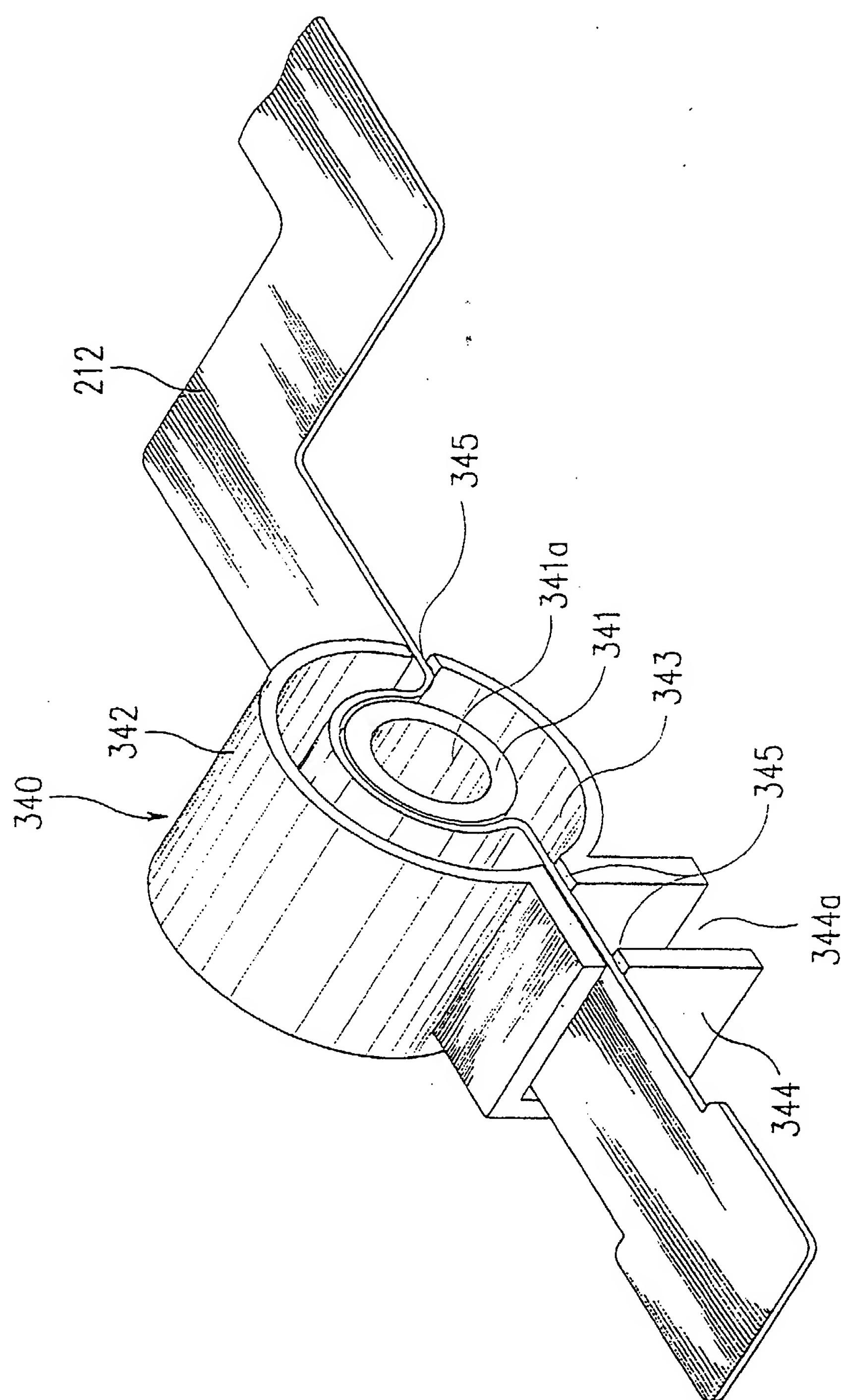


FIG. 7

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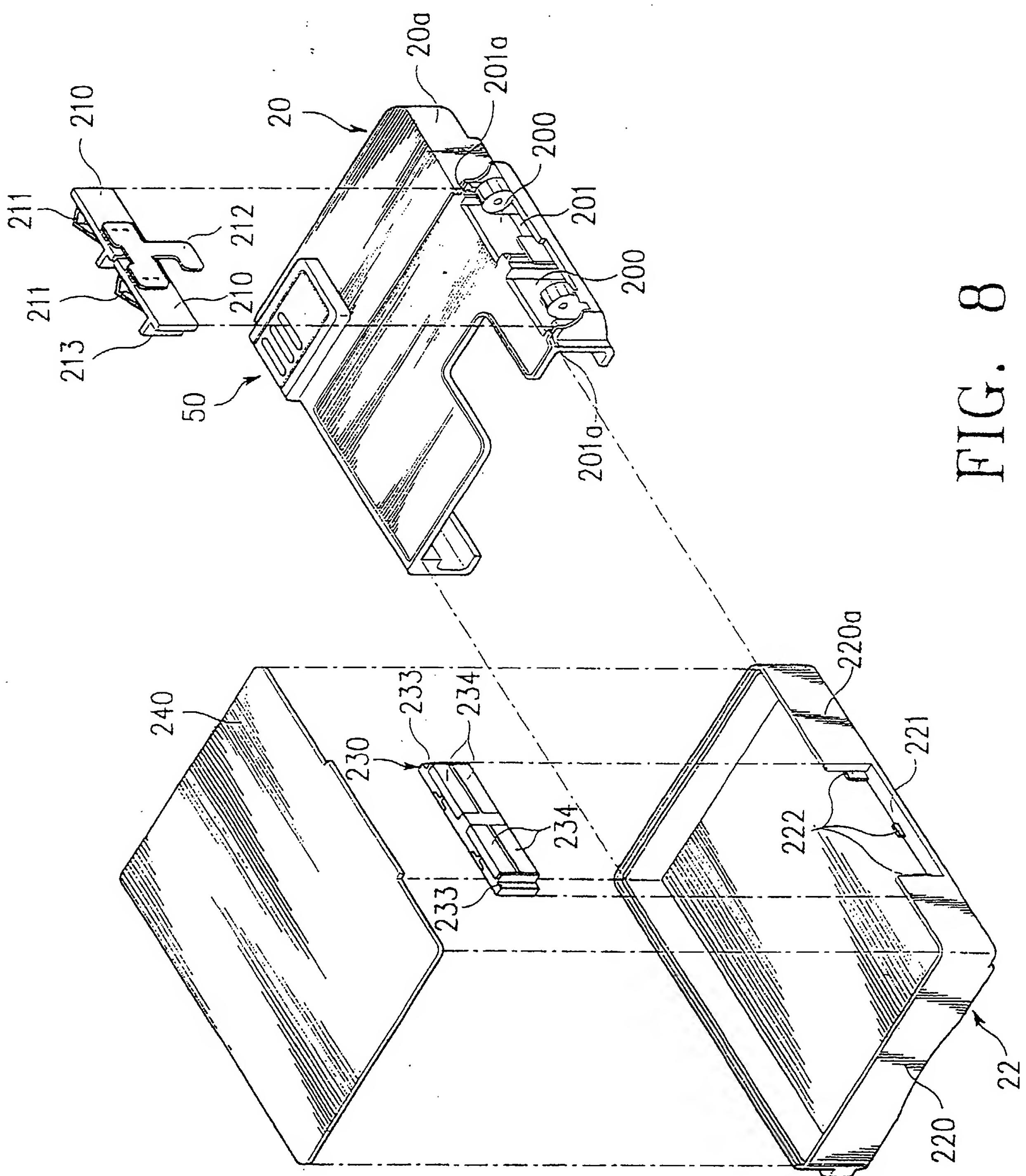


FIG. 8

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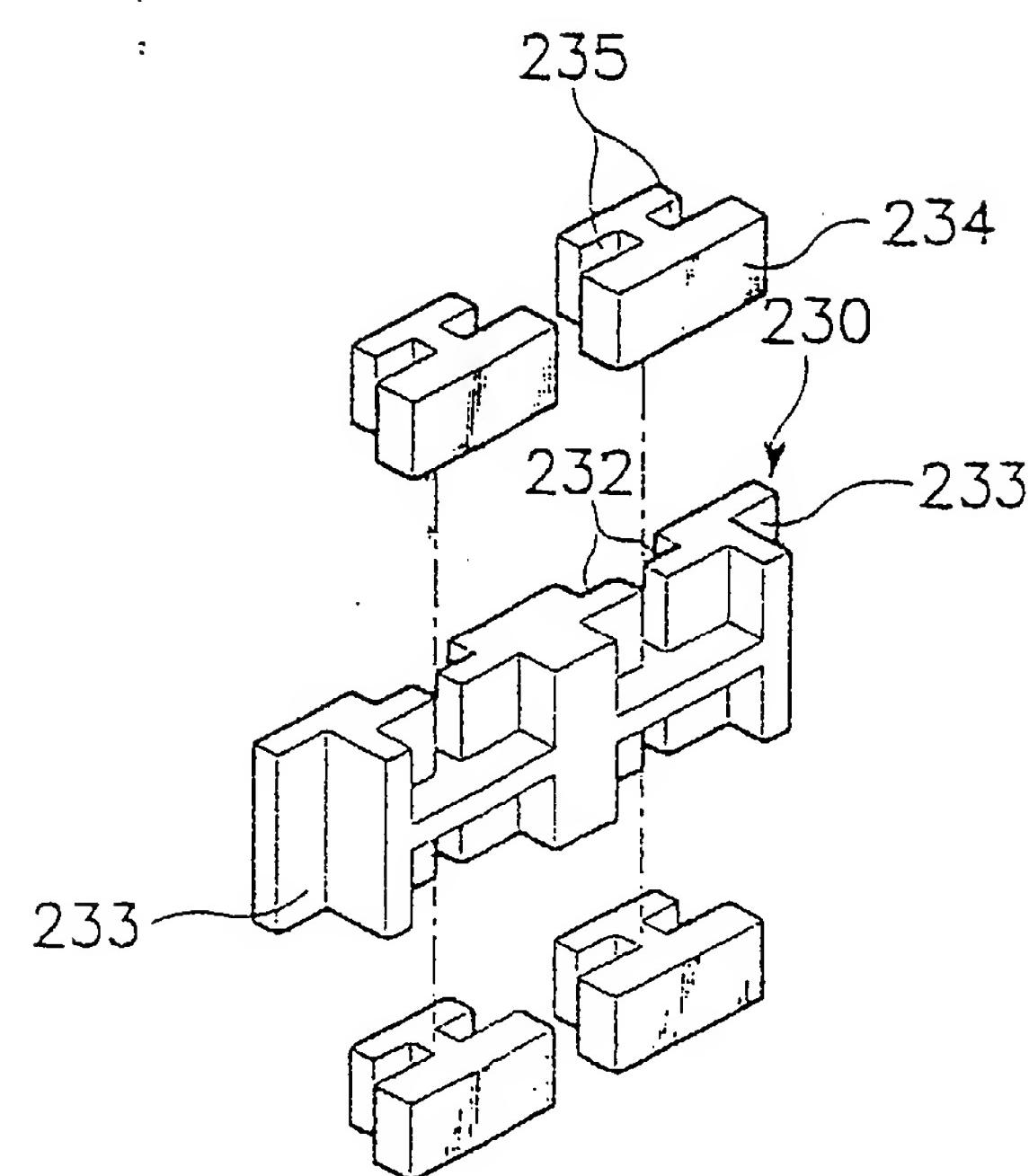


FIG. 9

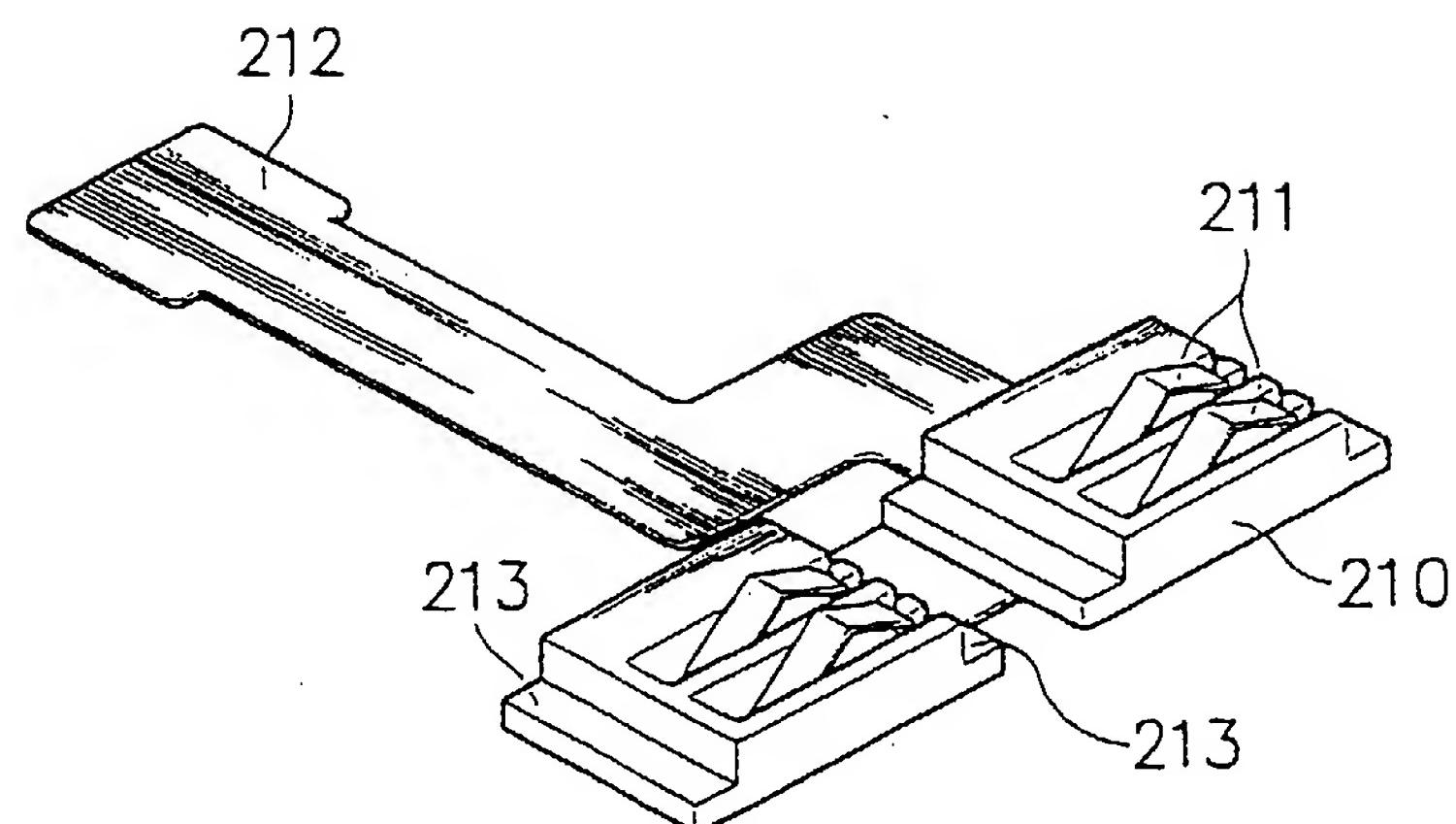


FIG. 10

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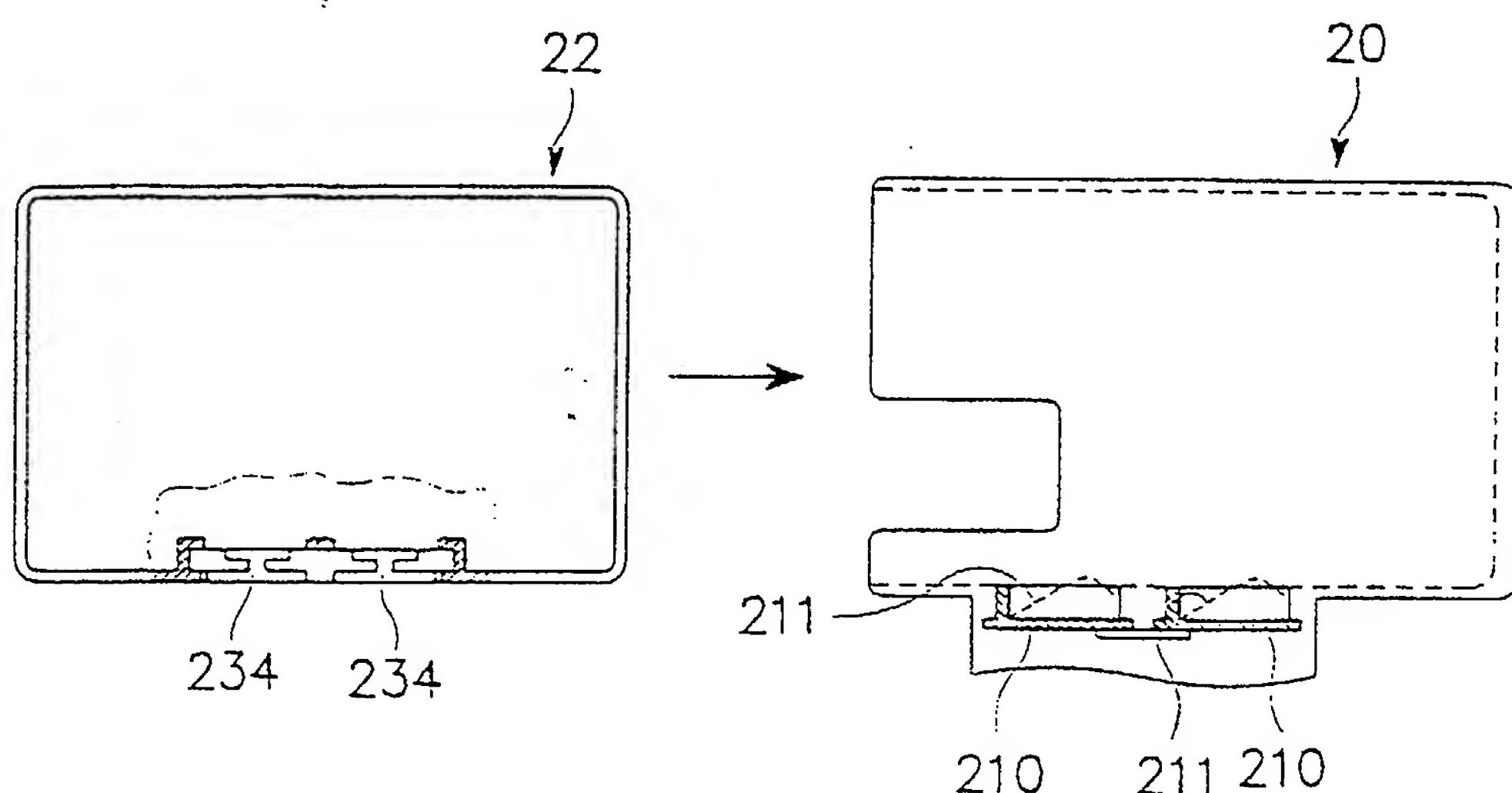


FIG. 11

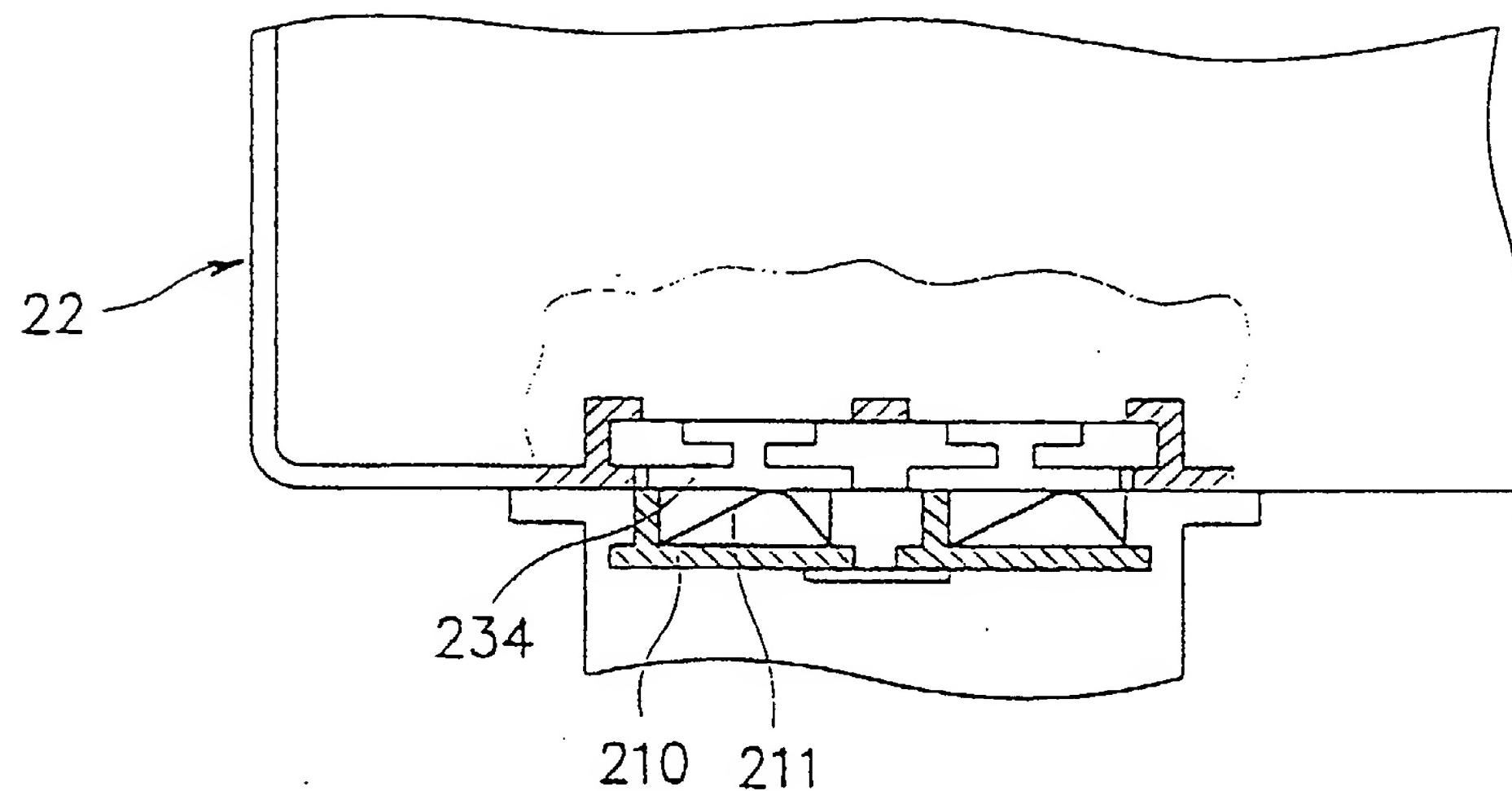
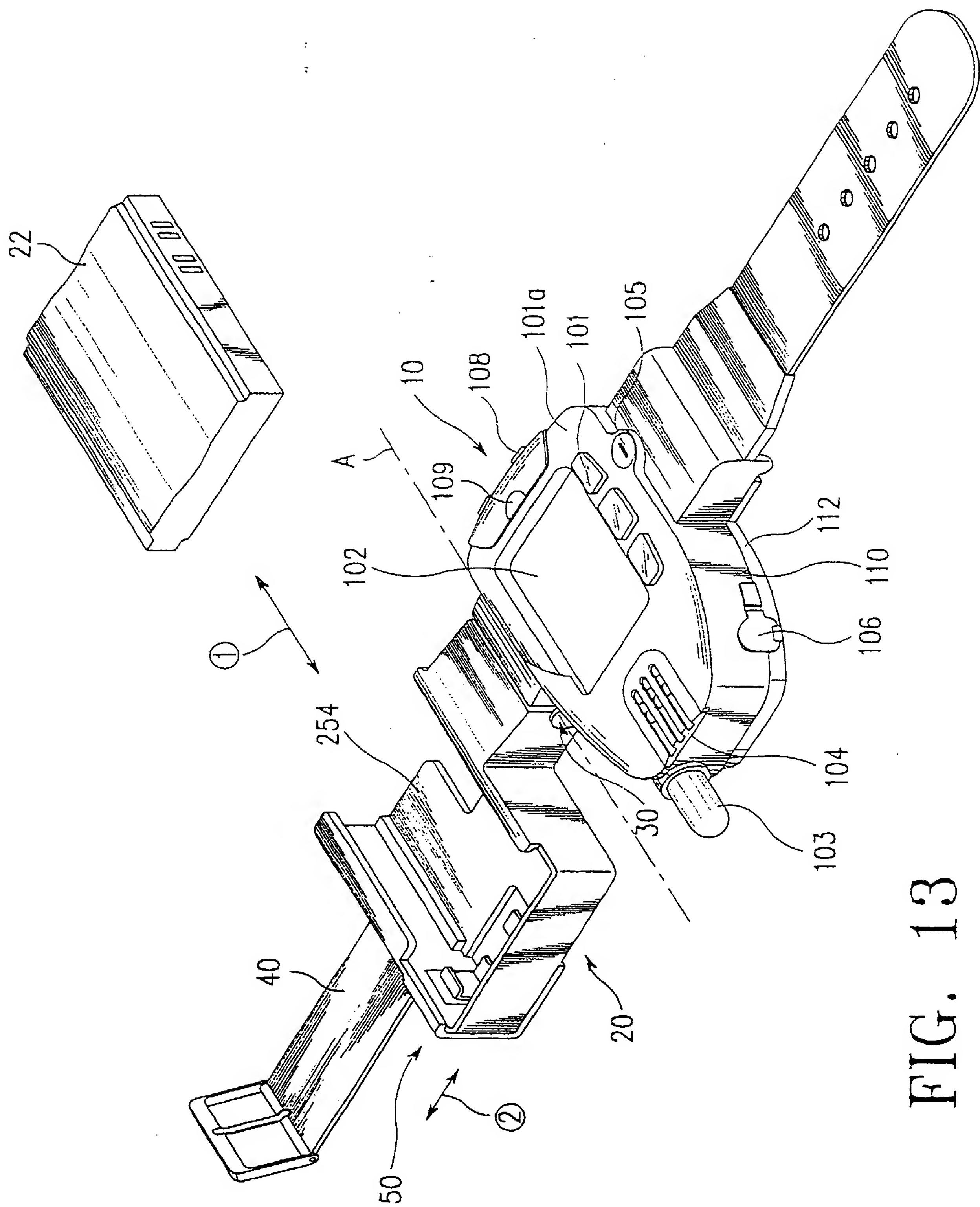


FIG. 12

FIG. 13



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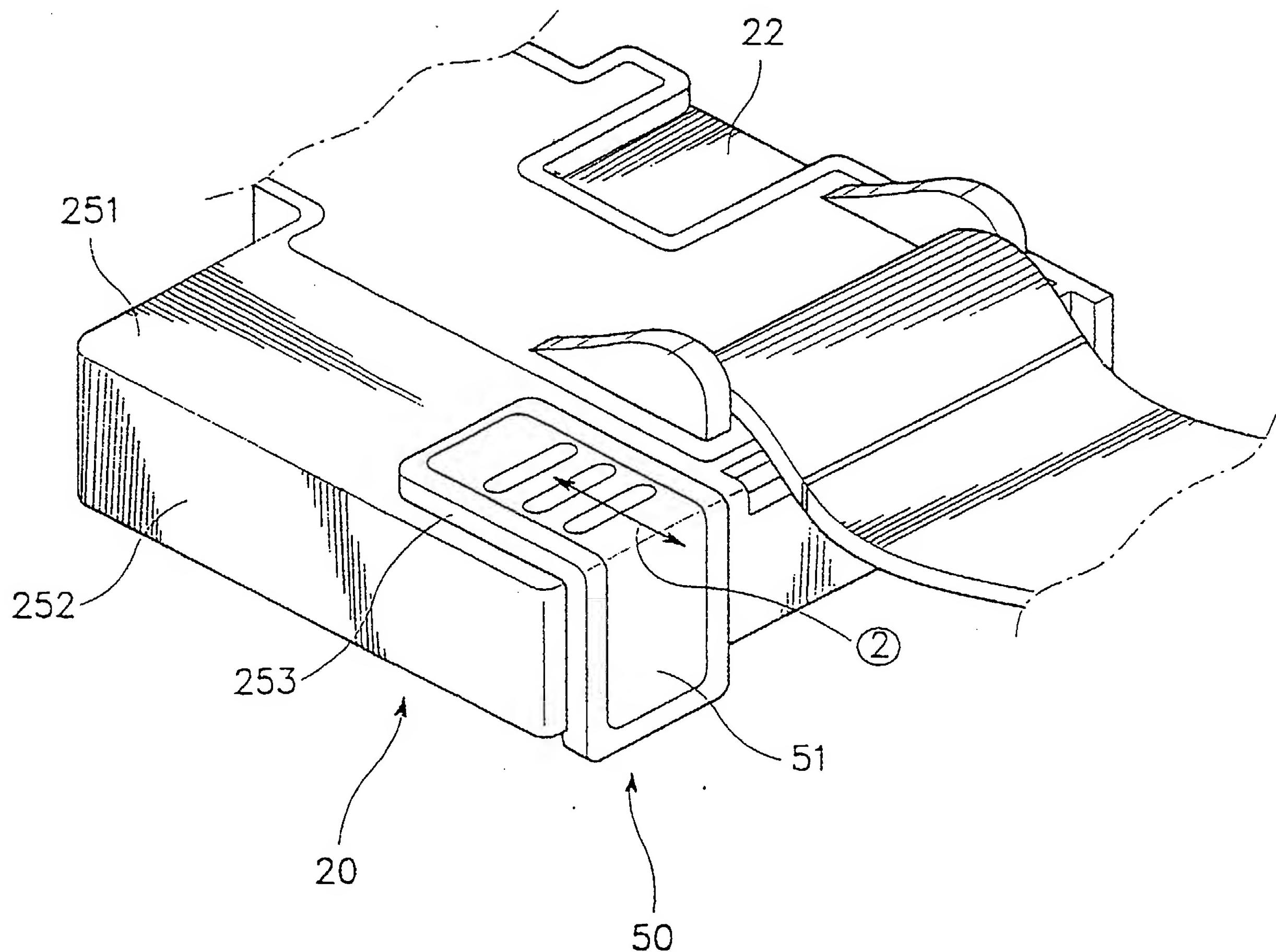


FIG. 14

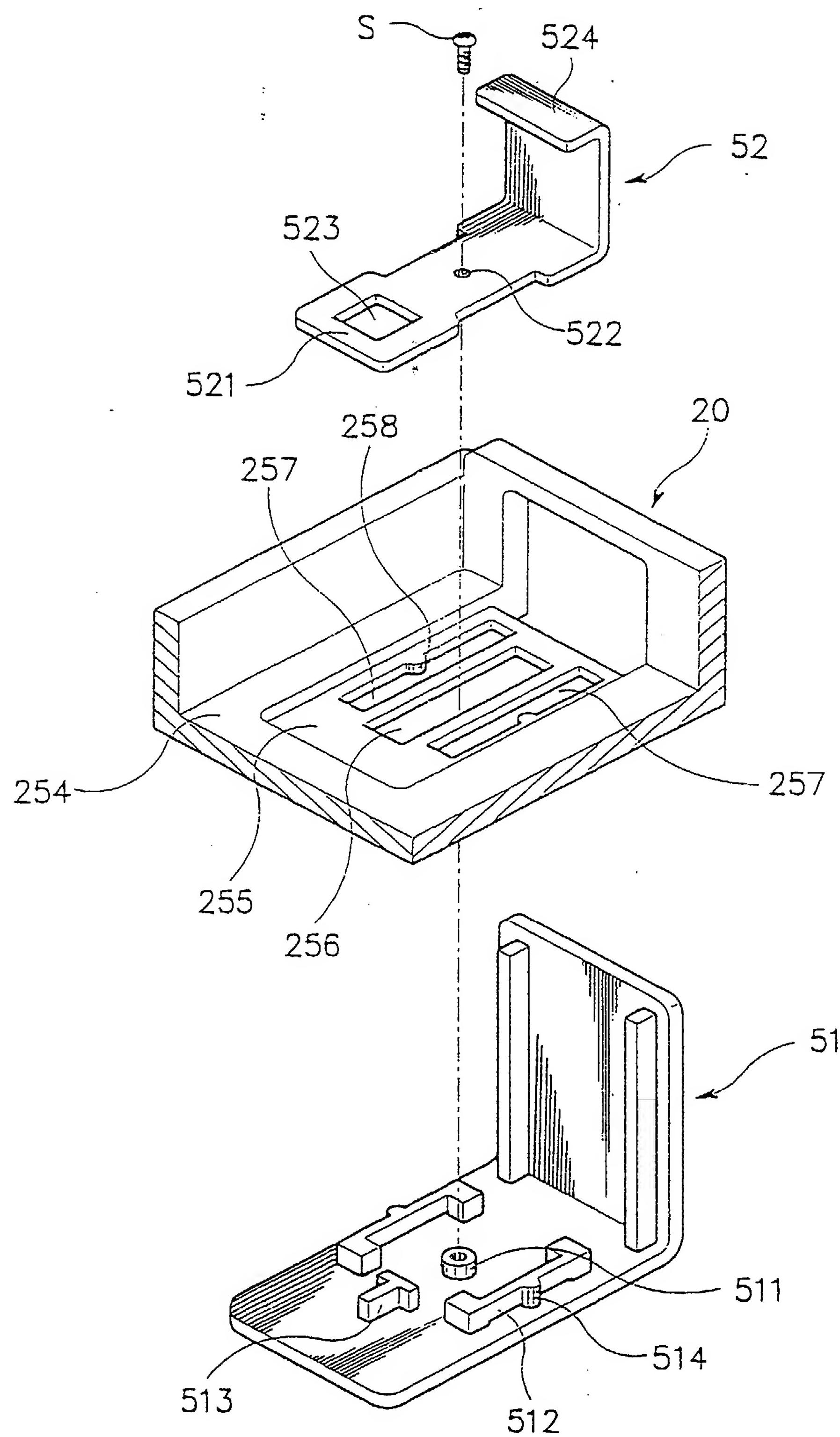


FIG. 15

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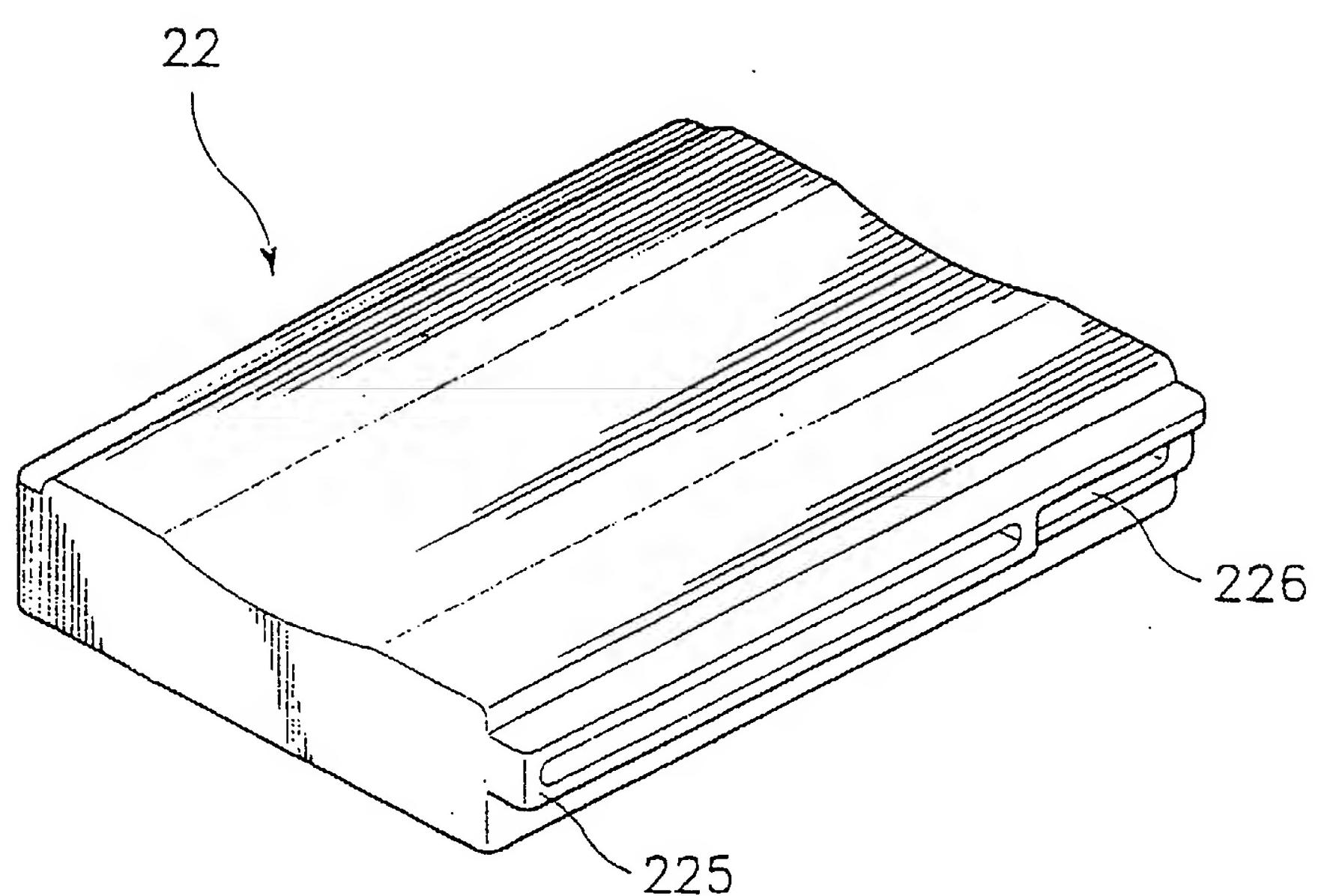


FIG. 16

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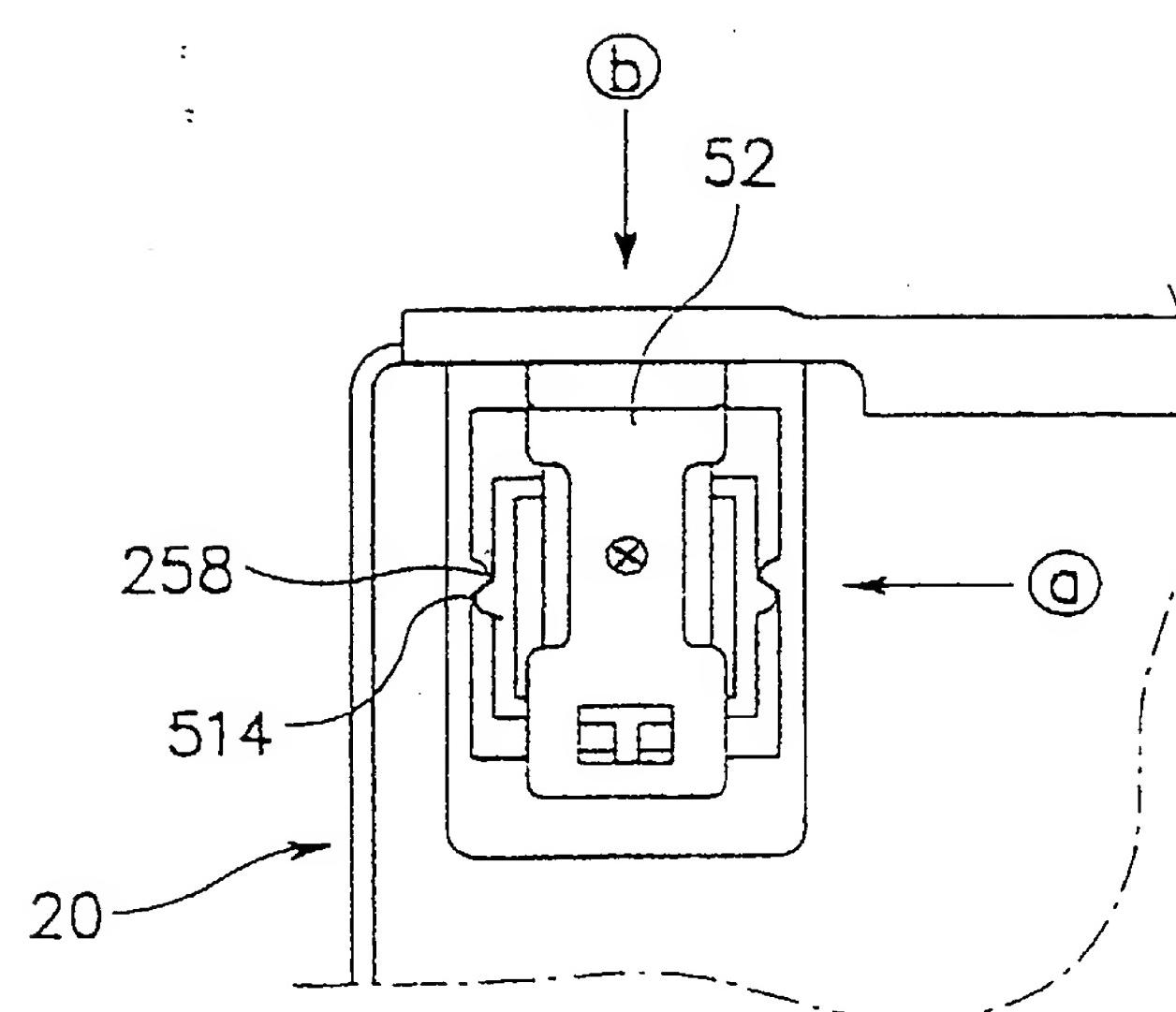


FIG. 17

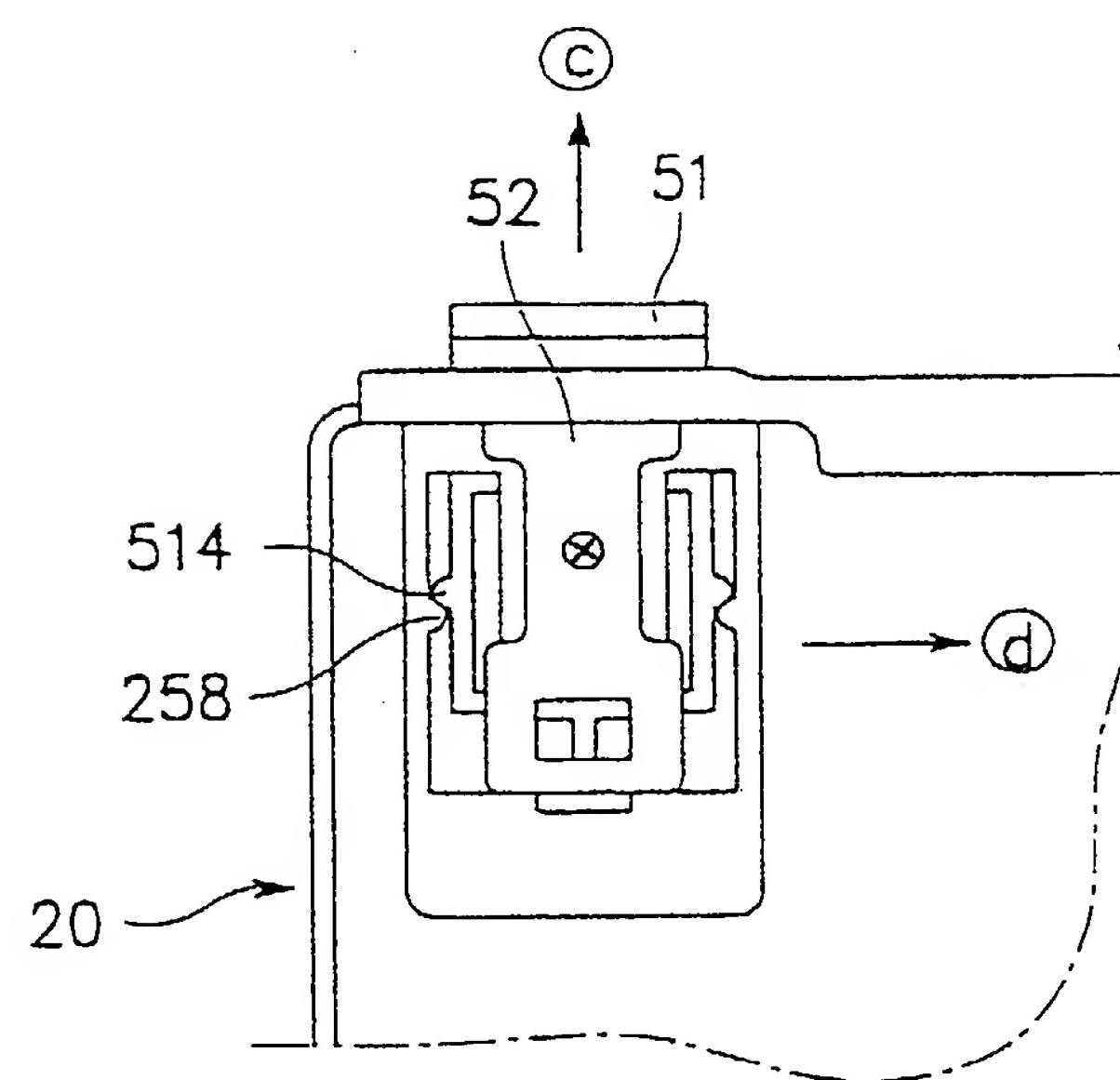
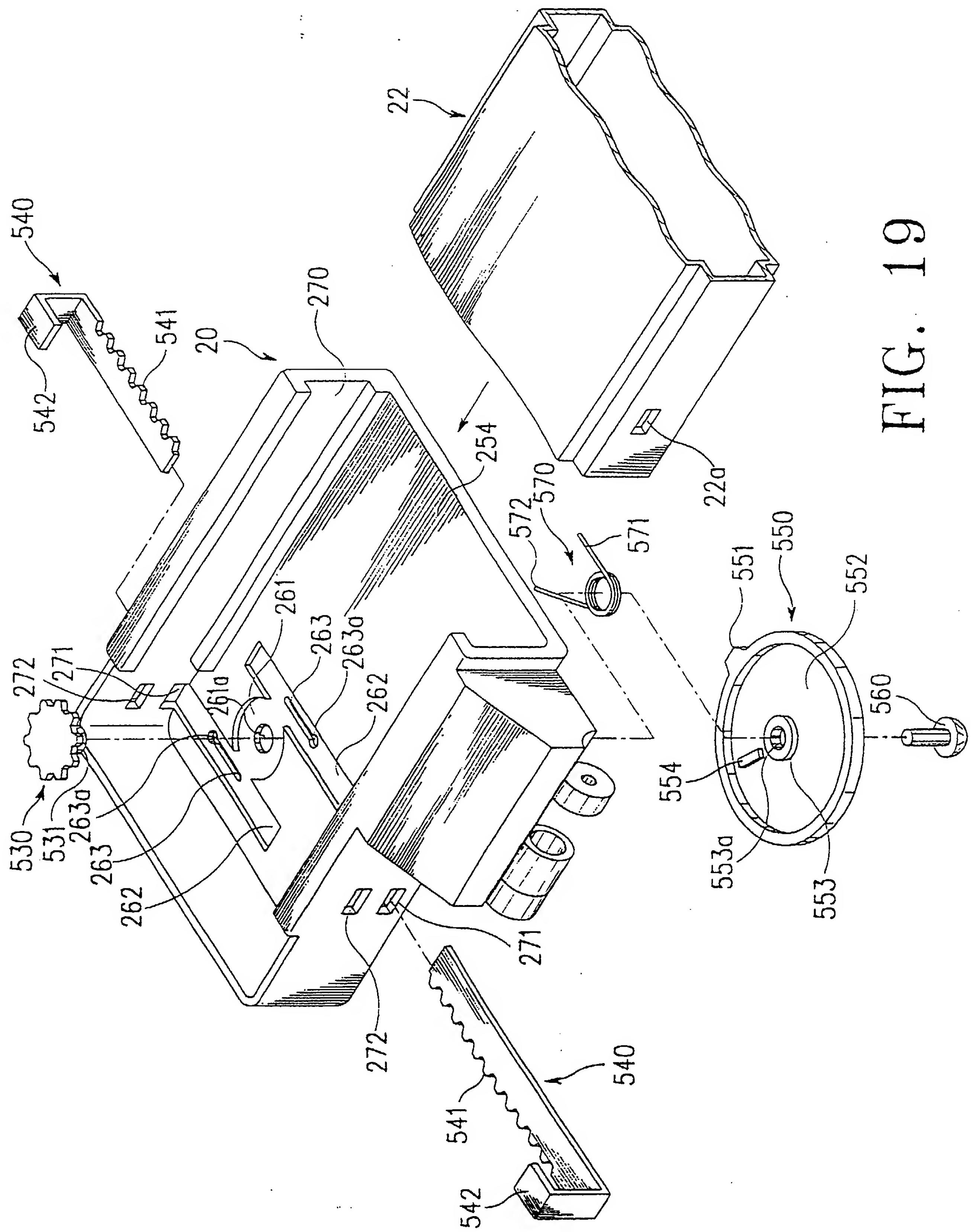


FIG. 18



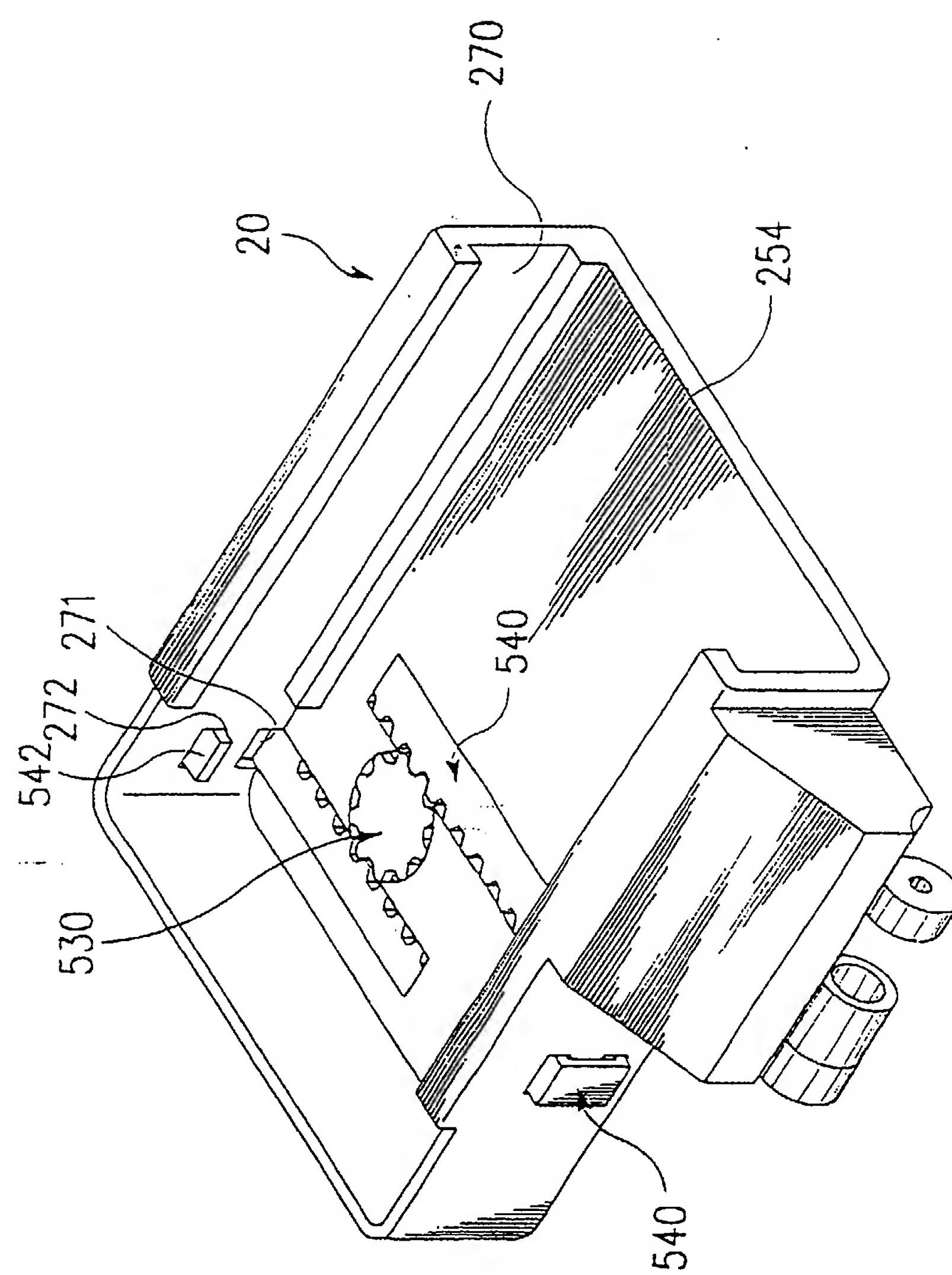


FIG. 20

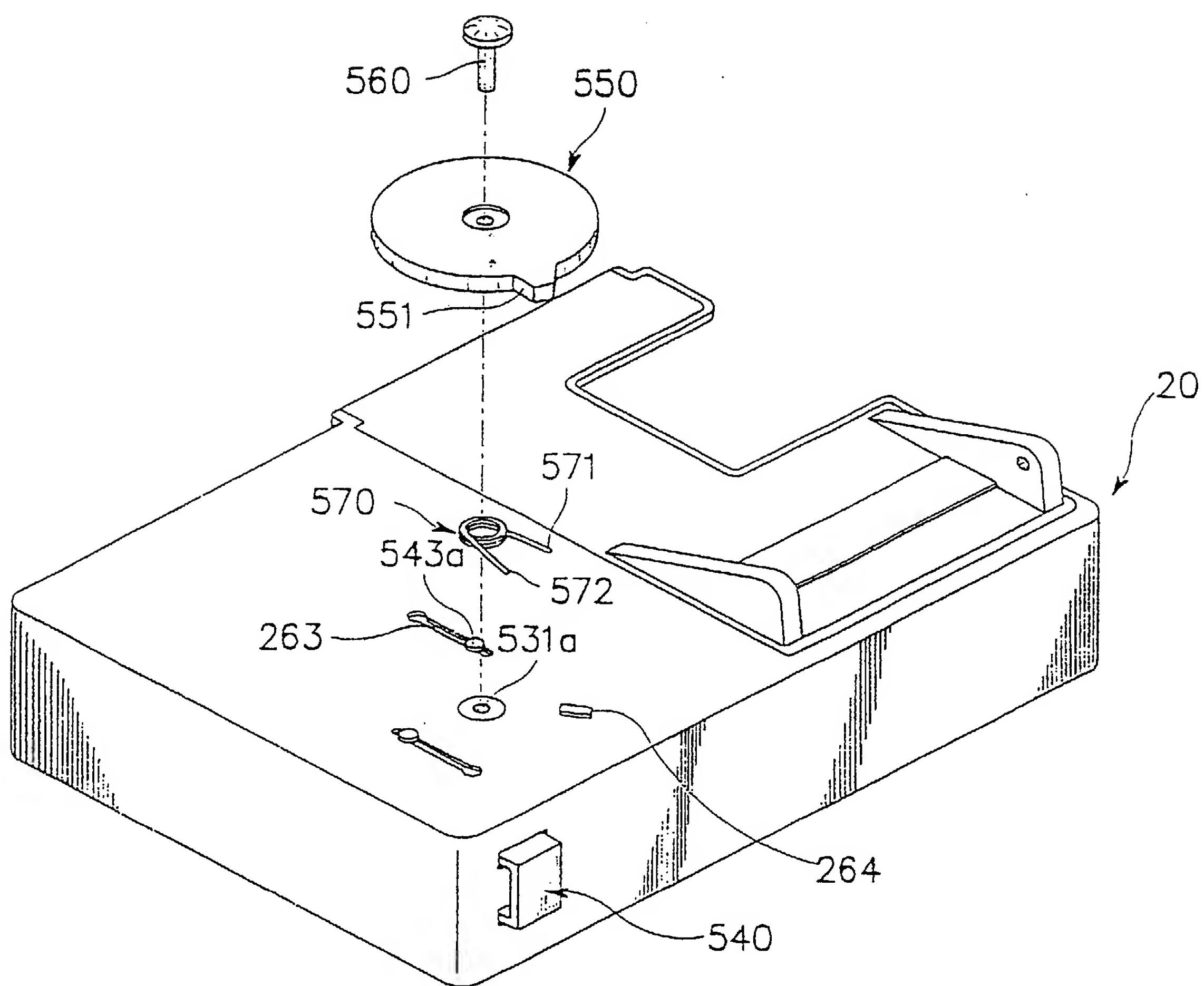


FIG. 21

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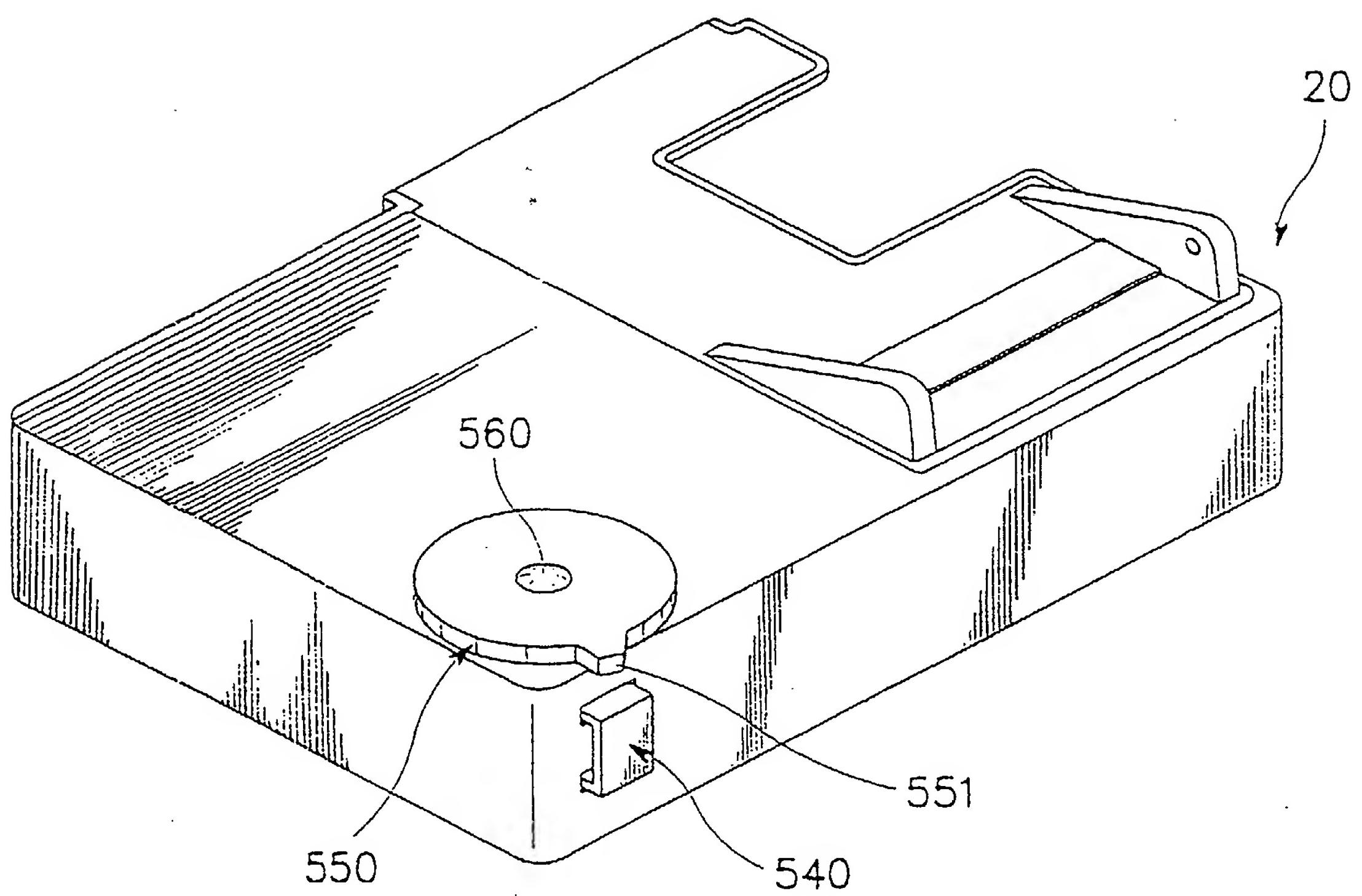


FIG. 22

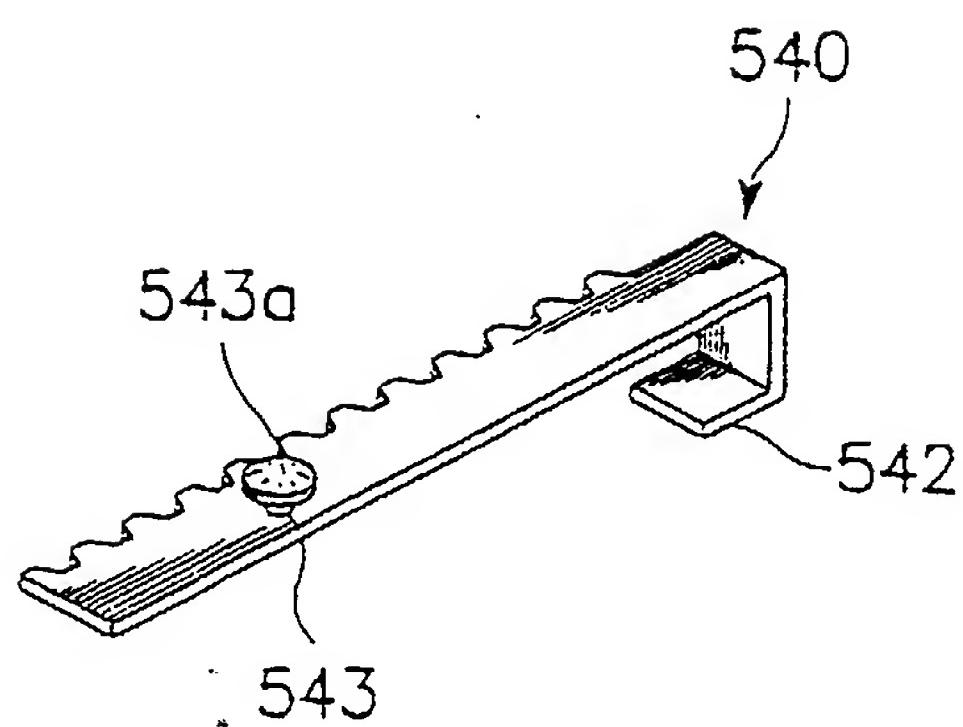


FIG. 23

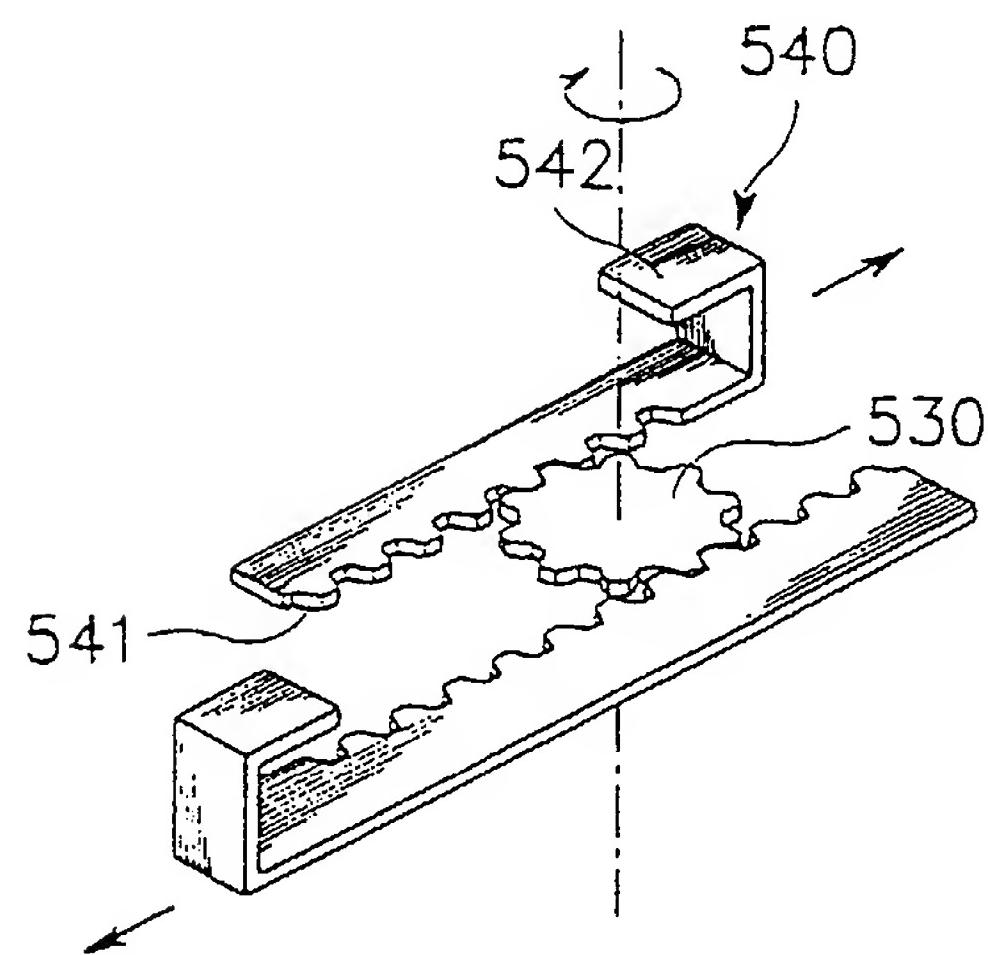


FIG. 24

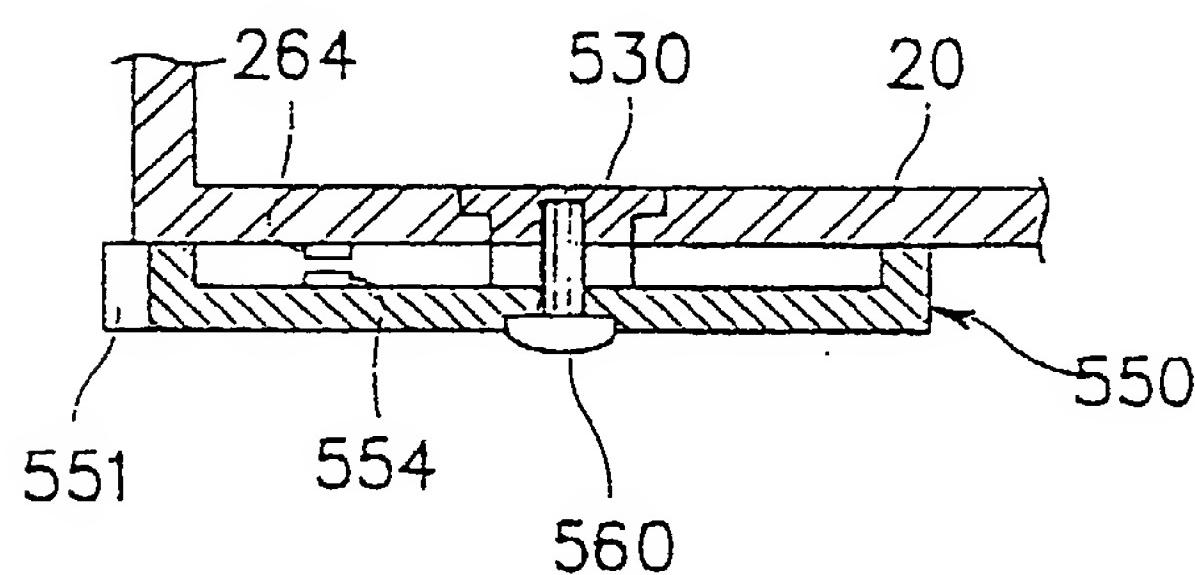


FIG. 25

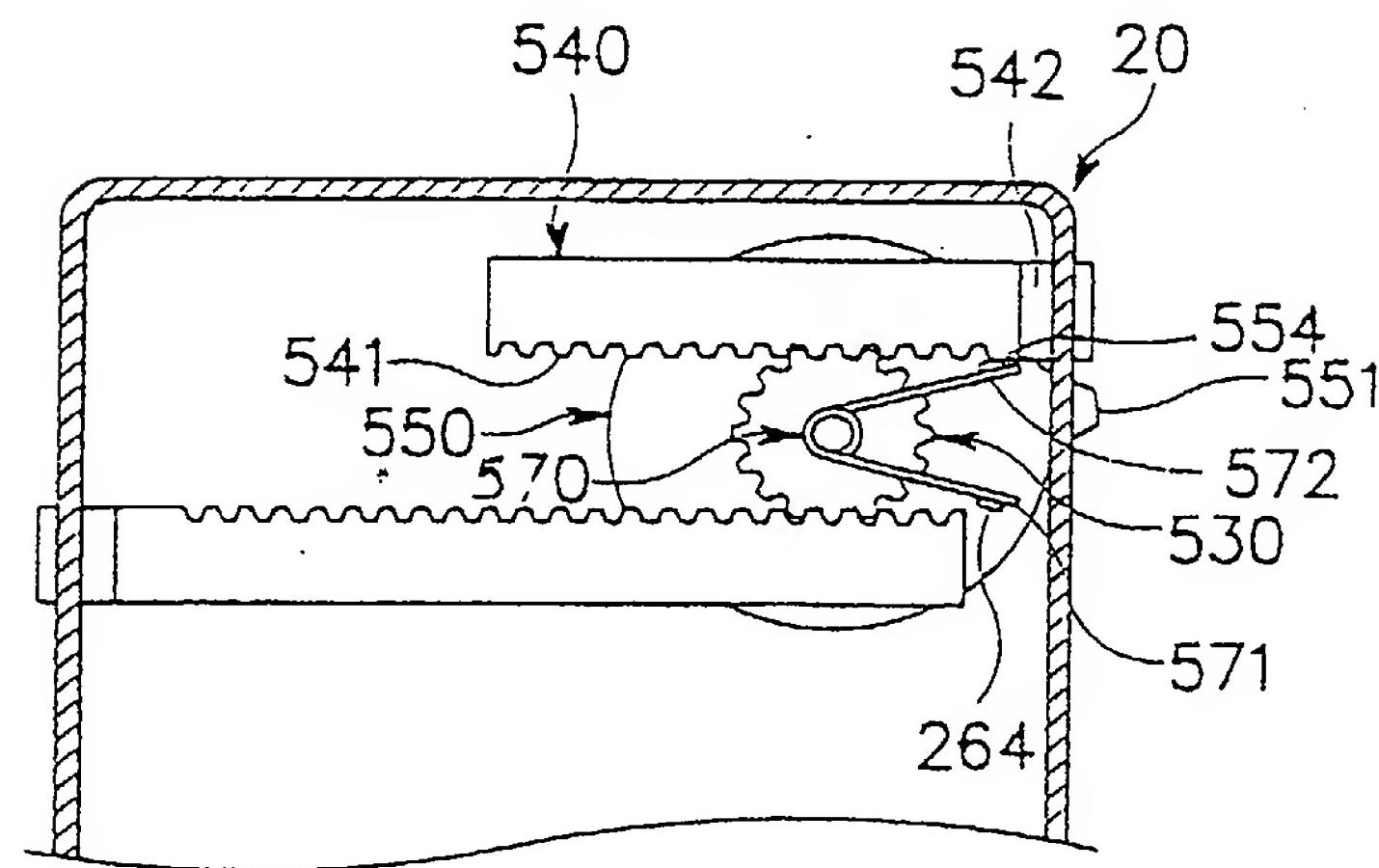


FIG. 26

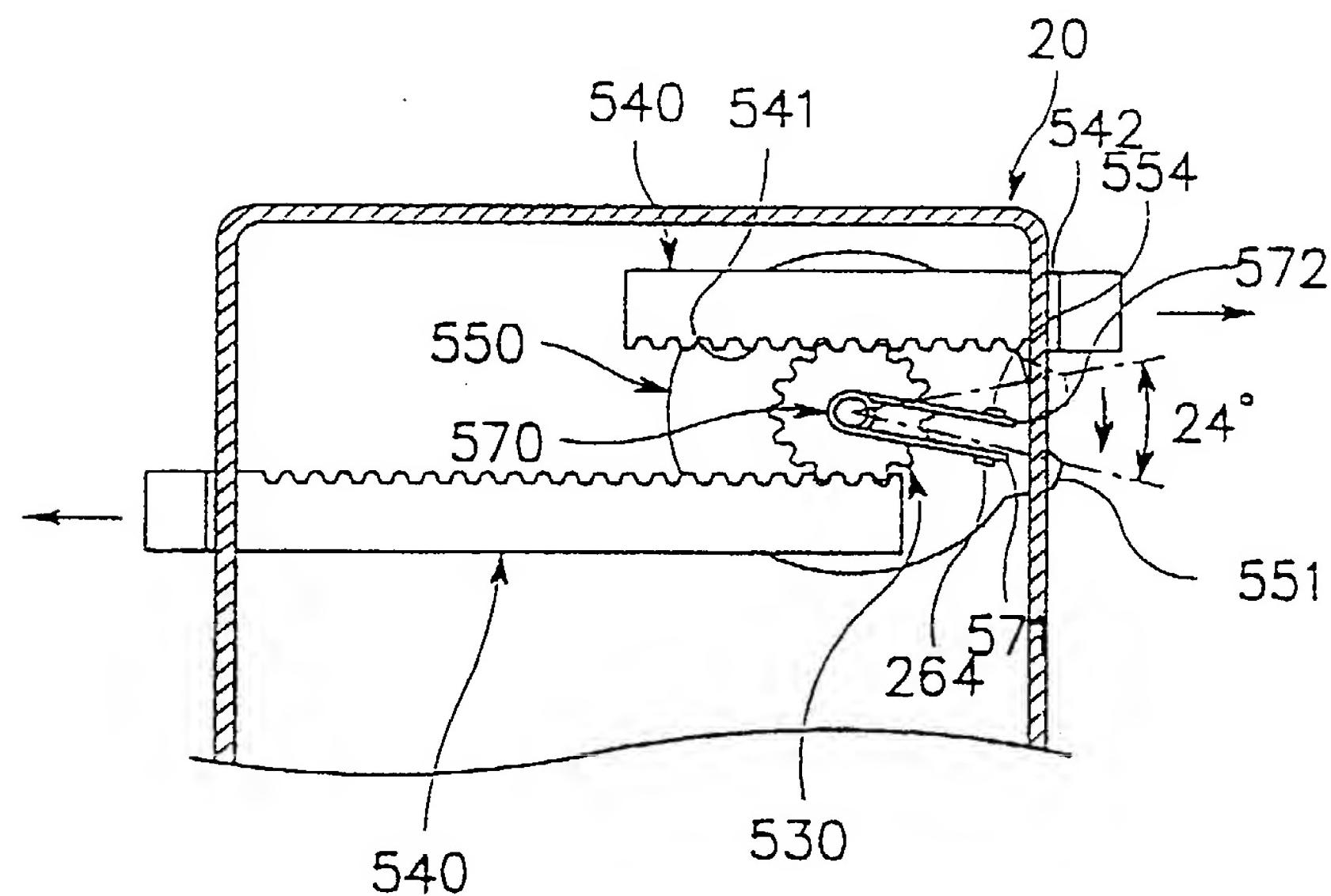
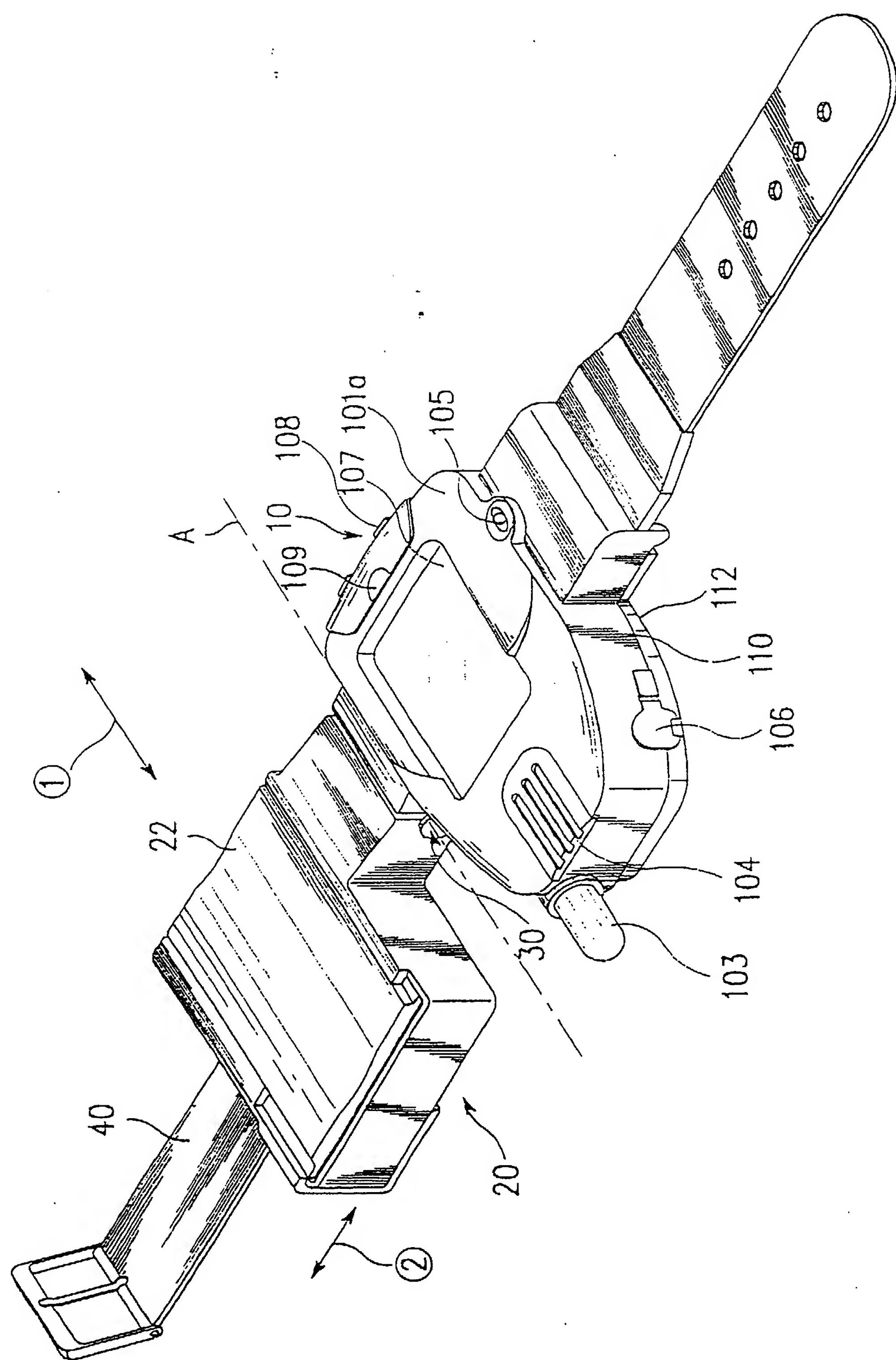


FIG. 27

FIG. 28



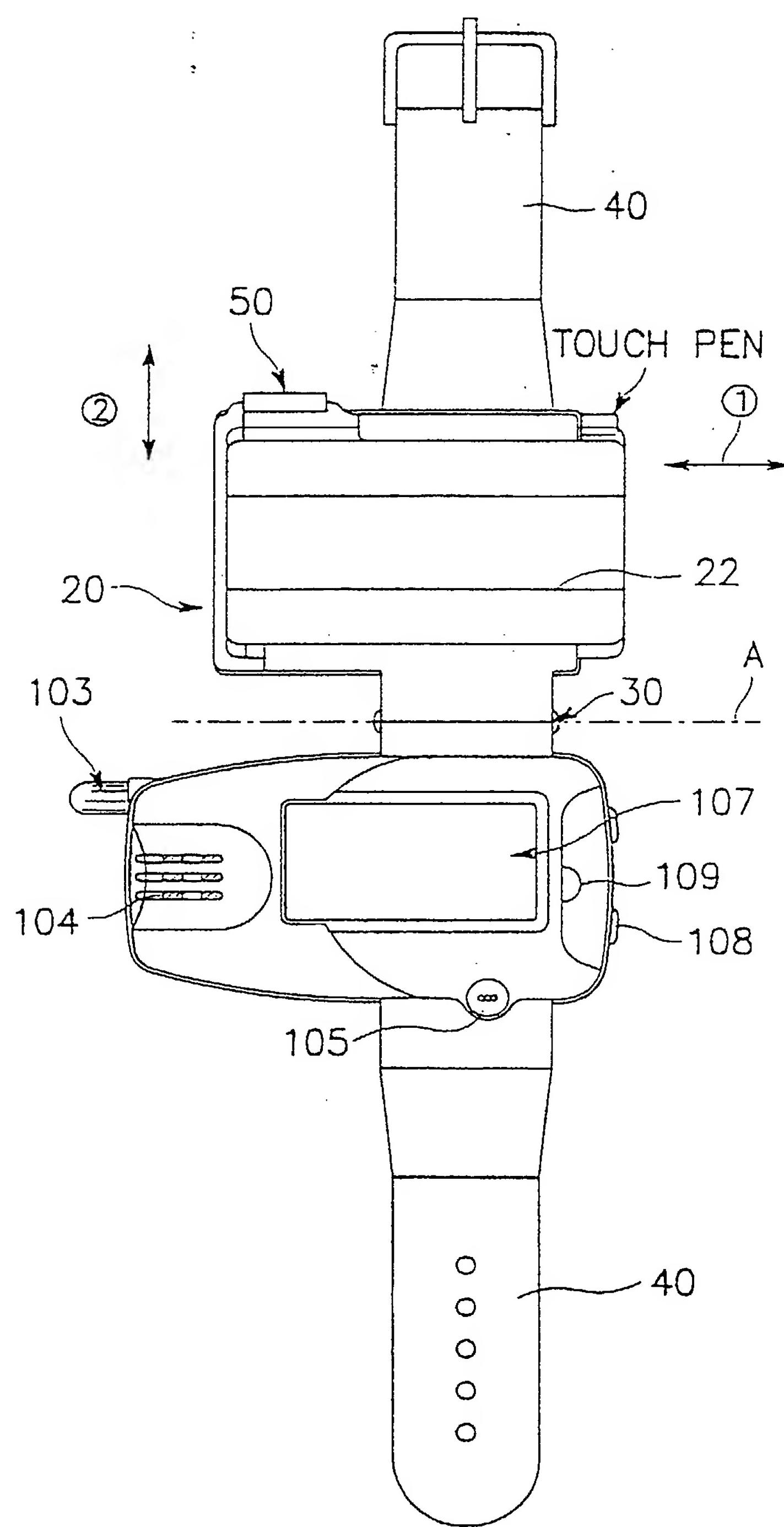


FIG. 29

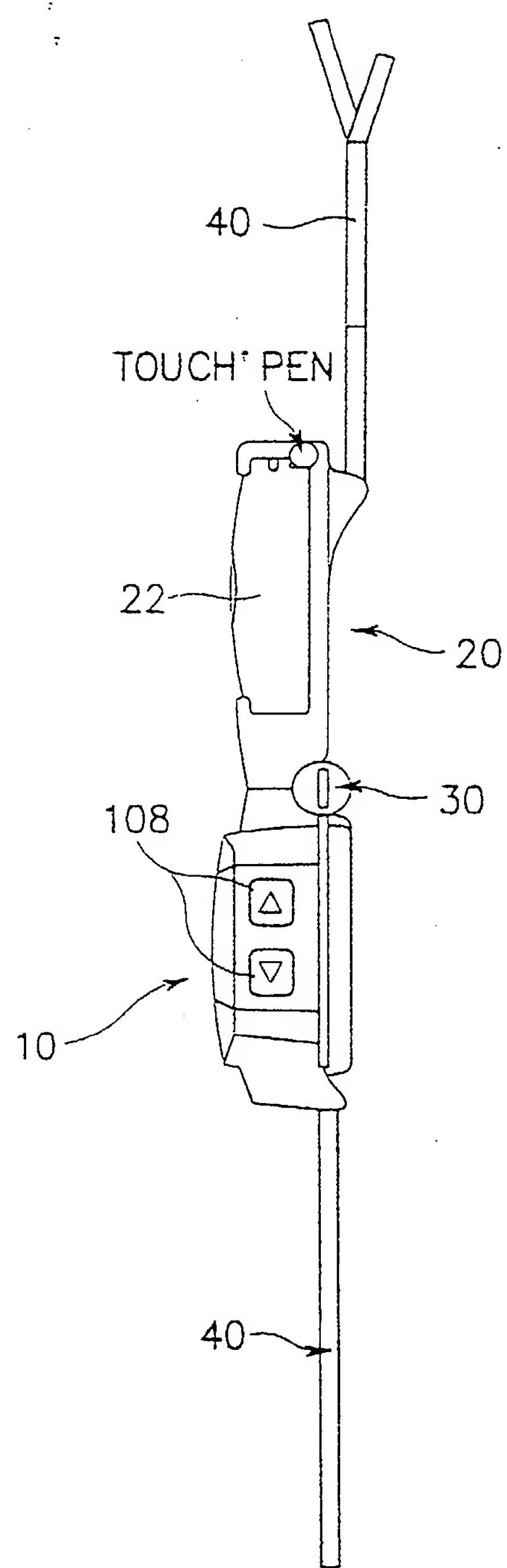


FIG. 30

WATCH TYPE PORTABLE RADIOTELEPHONE

The present invention relates to a portable radiotelephone, and more particularly, the present invention relates to a watch type portable radiotelephone which can be worn around the wrist.

Generally, portable radiotelephones refer to an HHP (hand-held programming device), a CT-2 (second generation cordless telephone), an analog type or digital type cellular phone, a personal communication system (PCS) phone, etc. Such portable radiotelephones perform a communication function while conducting radio communications with a base station.

Currently, developments of such portable radiotelephones are kept in pace with the tendency of electronic elements to provide a high sensitivity, a compactness and a lightness. Portable radiotelephones can be classified, in terms of external construction, into a first generation one having a bar type construction and a second generation one having a flip type construction. Currently, the flip type portable radiotelephones and third generation folder type portable radiotelephones are widely used. In the future, the tendency toward the use of the folder type portable radiotelephones or portable terminals having a more compact construction will be increased.

A conventional bar type portable radiotelephone comprises a body element, an antenna unit which is installed at an upper end of the body element, an earpiece which is located below the antenna unit and includes a speaker, an LCD unit which is installed below the earpiece, a key pad which is located below the LCD unit and includes a multitude of number keys and function keys, and a microphone unit which is located below the key pad.

A conventional flip type portable radiotelephone (as disclosed in U.S. Patent No. 5,629,979) comprises a body element, a flip element, and a hinge unit for connecting the body element and the flip element with each other. In the conventional flip type portable radiotelephone, an antenna unit is installed at an upper end of the body element, an earpiece including a speaker is located below the antenna unit, an LCD unit is mounted below the earpiece, a key pad including a multitude of number keys and function keys is disposed below the LCD unit, and a microphone unit is mounted below the key pad. The microphone unit can be installed at the flip element, as occasion demands.

A further conventional folder type portable radiotelephone (as disclosed in U.S. Patent No. 5,628,089) comprises a body element, a folder, and a hinge unit for rotating the folder at one end of the body element by an angle capable of rendering communication. In the

conventional folder type portable radiotelephone, an antenna unit is installed at an upper end of the body element, a key pad including a multitude of number keys and function keys is disposed below the antenna unit, and
5 a microphone unit is mounted below the key pad. An earpiece including a speaker is located at an upper end of the folder which is opened and closed by the hinge unit, and an LCD unit is mounted below the earpiece. At this time, the hinge unit which opens and closes the folder from and to the body element, respectively, performs a function of electrically as well as mechanically connecting the body element and the folder with each
10 other.

15 Among the bar type, flip type and folder type portable radiotelephones, the flip type or the folder type portable radiotelephones which provide excellent sound sensitivity level, are increasingly used.

20 The reason why the use of the flip type portable radiotelephones is increasing currently is that the flip element coupled to the body element serves in a standby mode to protect the multitude of keys provided on the body element, thereby preventing erroneous operations of those keys, while serving in a talking mode as a reflecting plate for concentrating sound during speaking, thereby
25 enhancing the sound sensitivity level. In addition, the flip type construction is advantageous in terms of

compactness of the body element in that the microphone unit can be installed on the flip cover.

Similar to the flip type construction, the reason why the use of the folder type portable radiotelephones is increasing currently is that the folder coupled to the body element serves in a standby mode to protect a key pad provided on the body element, thereby preventing erroneous operations of the multitude of keys, while serving in a talking mode as a reflecting plate for concentrating sound during speaking, thereby enhancing the sound sensitivity level. In addition, the folder type construction is advantageous in terms of compactness of the body element in that the speaker unit and the LCD unit can be installed on the folder.

At this time, while the trend of portable radiotelephones is currently toward the miniaturisation, there exists strictly a limit on miniaturising the portable radiotelephones because a minimum distance must be spanned between the ear and the mouth of a user. In other words, in the case of the portable radiotelephone, a distance over 14 cm must be spanned between a talking section (where a microphone is installed) and a hearing section (where an earpiece including a speaker is located) of the portable radiotelephone. Accordingly, the flip type or the folder type portable radiotelephones can only be miniaturised while maintaining an adequate total

length.

Therefore, in the conventional bar type, flip type or folder type portable radiotelephones, strict limits exist in miniaturising them. Hence, the conventional portable radiotelephones suffer from the problem that portability thereof is deteriorated. While it is the norm that the radiotelephones are either put in pockets or separate bags, or hand-held, in these cases, the likelihood of the radiotelephones becoming lost is remarkably increased. Also, if the radiotelephones are dropped due to careless handling or impacts are applied to the radiotelephones, the radiotelephones are likely to be damaged and rendered useless.

Furthermore, conventional radiotelephones suffer from the problem that they operate reliably in a waterproof manner.

Accordingly, the present invention has been made in an effort to solve or at least mitigate the problems occurring in the related art.

Accordingly, the present invention provides a portable radiotelephone comprising: a body element including upper and lower case frames; a battery pack holder including a battery pack for supplying power to the body element; locking means for locking and unlocking the battery pack to and from the battery pack holder, respectively; hinge means for rotatably connecting the body element and the battery pack

holder with each other; and a wrist band connected to the body element and the battery pack holder for enabling the portable radiotelephone to be worn around the wrist.

5 Advantageously, embodiments of the present invention provide a watch type portable radiotelephone which is advantageous in terms of miniaturisation thereof; a type portable radiotelephone in which a battery pack can be mounted to or dismounted from a battery pack holder in a state wherein it is separated from a body element; a watch type portable radiotelephone which can be worn around the wrist thereby minimizing the likelihood of its falling down.

10 Still further, embodiments of the present invention provide a watch type portable radiotelephone which has hinge means for rendering increased portability when the watch type radiotelephone is worn around the wrist, thereby ensuring convenience; a watch type portable radiotelephone which has hinge means for enabling a flexible printed circuit capable of electrically connecting a battery pack to a body element separated from a battery pack holder to be smoothly guided; a watch type portable radiotelephone which has connection means for electrically connecting a battery pack holder separated from a body element to a battery pack; a watch type portable radiotelephone which has terminal connection means possessing a waterproof structure; and/or a watch type portable radiotelephone which has locking means

capable of easily locking and unlocking a battery pack to and from a battery pack holder, respectively.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawing in which:

5 figure 1 is a perspective view illustrating a watch type portable radiotelephone in accordance with a preferred embodiment of the present invention;

figure 2 is a front view illustrating the watch type portable radiotelephone in accordance with the preferred embodiment of the present invention;

10 figure 3 is a side view illustrating the watch type portable radiotelephone in accordance with the preferred embodiment of the present invention;

15 figure 4 is an exploded perspective view of a battery pack holder in accordance with the preferred embodiment of the present invention;

figure 5 is an exploded perspective view partially illustrating a hinge part of a body element in accordance with the preferred embodiment of the present invention;

20 figure 6 is an exploded perspective view illustrating hinge means in accordance with the preferred embodiment of the present invention;

25 figure 7 is a partial perspective view illustrating a state wherein a flexible printed circuit in accordance with the preferred embodiment of the present invention is inserted into a centre hinge arm of the body element;

figure 8 is an exploded perspective view illustrating connection means for battery pack terminals of the watch type portable radiotelephone in accordance with the preferred embodiment of the present invention;

5 figure 9 is an exploded perspective view illustrating a construction of a terminal holder of a battery pack in accordance with the preferred embodiment of the present invention;

10 figure 10 is a perspective view illustrating a pair of contact spring holders to which four contact springs in accordance with the preferred embodiment of the present invention are mounted;

15 figure 11 is a partially cross-sectioned view illustrating a state just before the battery pack in accordance with the preferred embodiment of the present invention is mounted to the battery pack holder;

20 figure 12 is a partially cross-sectioned view illustrating another state wherein the battery pack in accordance with the preferred embodiment of the present invention is mounted to the battery pack holder;

figure 13 is a perspective view illustrating the watch type portable radiotelephone from which the battery pack in accordance with the preferred embodiment of the present invention is dismounted;

25 figure 14 is a partial perspective view illustrating battery pack locking means in accordance with the preferred embodiment of the present invention;

figure 15 is an exploded perspective view

illustrating the battery pack locking means in accordance with the preferred embodiment of the present invention;

figure 16 is a perspective view illustrating the battery pack in accordance with the preferred embodiment of the present invention;

figure 17 is a bottom view illustrating the battery pack locking means in the case that the battery pack in accordance with the preferred embodiment of the present invention is mounted to the battery pack holder;

figure 18 is a bottom view illustrating the battery pack locking means in the case that the battery pack in accordance with the preferred embodiment of the present invention is dismounted from the battery pack holder;

figure 19 is an exploded perspective view illustrating battery pack locking means of a watch type portable radiotelephone in accordance with a second preferred embodiment of the present invention;

figure 20 is a perspective view illustrating a battery pack holder to which the battery pack locking means in accordance with the second preferred embodiment of the present invention is installed;

figure 21 is an exploded perspective view illustrating a lower surface of the battery pack holder to which the battery pack locking means in accordance with the second preferred embodiment of the present invention is installed;

figure 22 is a perspective view illustrating the lower surface of the battery pack holder to which the

battery pack locking means in accordance with the second preferred embodiment of the present invention is installed;

5 figure 23 is a perspective view illustrating a locking member of the battery pack locking means in accordance with the second preferred embodiment of the present invention;

10 figure 24 is an operational view illustrating operations of a pinion gear and a pair of locking members in accordance with the second preferred embodiment of the present invention;

15 figure 25 is a partial cross-sectional view illustrating a state wherein the pinion gear and a lever in accordance with the second preferred embodiment of the present invention are installed to the battery pack holder;

20 figure 26 is an operational view illustrating a state wherein the pair of locking members of the battery pack locking means in accordance with the second preferred embodiment of the present invention are in a locking position;

25 figure 27 is an operational view illustrating another state wherein the pair of locking members of the battery pack locking means in accordance with the second preferred embodiment of the present invention is in an unlocking position;

figure 28 is a perspective view illustrating a watch type portable radiotelephone in accordance with a third

preferred embodiment of the present invention;

figure 29 is a front view illustrating the watch type portable radiotelephone in accordance with the third preferred embodiment of the present invention; and

5 figure 30 is a side view illustrating the watch type portable radiotelephone in accordance with the third preferred embodiment of the present invention.

Figure 1 is a perspective view illustrating a watch type portable radiotelephone in accordance with a 10 preferred embodiment of the present invention. Figure 2

is a front view illustrating the watch type portable radiotelephone in accordance with the preferred embodiment of the present invention. Figure 3 is a side view 15 illustrating the watch type portable radiotelephone in accordance with the preferred embodiment of the present invention.

Referring to figures 1 to 4, a watch type portable radiotelephone in accordance with a preferred embodiment of the present invention is largely divided into four 20 sections. That is, the watch type portable radiotelephone comprises a body element 10, a battery pack holder 20 to which power supply means such as a battery pack 22 can be locked, locking means 50 for locking and unlocking the battery pack 22 to and from the battery pack holder 20, respectively, and hinge means 30 which rotatably connects the body element 10 and the battery pack holder 20 with each other. The watch type portable radiotelephone according to the present invention further comprises a 25

wrist band 40 which is connected to the body element 10 and the battery pack holder 20 for enabling the watch type portable radiotelephone to be worn around the wrist.

The watch type portable radiotelephone is
5 extraordinarily advantageous in terms of miniaturisation of the body element 10, due to the fact that the battery pack 22 which serves as power supply means is not locked to the body element 10, but locked to the battery pack holder 20 which is rotatably connected to the body element 10 by the hinge means 30.

Because the body element 10 and the battery pack 22 are separated from each other, the body element 10 and the battery pack 22 are constructed in a manner such that the battery pack 22 is electrically connected to a board of 15 the body element 10 through separate connection means.

The wrist band 40 for enabling the watch type portable radiotelephone to be worn around the wrist is rotatably coupled at its ends to the body element 10 and the battery pack holder 20, respectively. To allow the 20 wrist band 40 to be connected to the body element 10 and the battery pack holder 20, a pair of hinge projections 201 are formed on a lower surface of the body element 10, and another pair of hinge projections 201 are formed on an outer surface of a bottom wall of the battery pack holder 25 20. Each pair of hinge projections 201 are formed in a

manner such that they are opposite to each other.

The body element 10 comprises upper 110 and lower 112 case frames. The upper 110 and lower 112 case frames are coupled to each other by a screw in the vertical direction. In the body element 10, there are disposed an RF board, a voice recognition unit (not shown), a frequency modulating unit (not shown), an RF module, and a receiver and a transmitter.

The body element 10 has data input means and data output means. While it is preferred that the data input means comprises at least one key 101, it is not necessary to limit the data input means to at least one key 101, and therefore, it is possible to input data through the voice recognition unit.

It is preferred that an LCD 102 is used as the data output means which responds to an operation of at least one key 101. According to this, a variety of display information and data can be displayed on the LCD 102 in response to operation of the data input means.

The data input means comprising at least one key 101 further includes waterproofing means (not shown). In other words, the key input means is provided with waterproofing means for preventing failure of the key operation due to inflow of water from the outside

environment.

Keys are disposed on a top face 101a and a side face 108a of the body element 10. A scroll key and a direction key are disposed on the face end 101a of the body element 10, and a function side key 108 is disposed on a side face 108a of the body element 10.

An antenna unit 103 which is electrically connected to a receiver (not shown) and a transmitter (not shown) is disposed in the body element 10. Also, in the body element 10, there are disposed a speaker unit 104 which is electrically connected to the receiver and a microphone unit 105 which is electrically connected to the transmitter. In addition, a telephone signal reception indicator lamp 109 is provided on the body element 10 to allow a user to confirm easily the reception of a telephone signal, and an ear microphone cover 106 for protecting a connection part, that is, socket for an earphone is provided to the body element 10.

The battery pack 22 for supplying power to the body element 10 is mounted to the battery pack holder 20. The battery pack 22 can be repeatedly locked to and unlocked from the battery pack holder 20, respectively, to be recharged. For this purpose, the battery pack holder 20 has the locking means 50 for locking and unlocking the battery pack 22 to and from the batter pack holder 20,

respectively. Moreover, to connect electrically the battery pack 22 to the body element 10, connection means is provided between the battery pack 22 and the body element 10.

5 The body element 10 and the battery pack holder 20 are mechanically connected with each other by the hinge means 30, and accordingly, the battery pack holder 20 can be rotated relative to the body element 10 about a rotating axis A.

10 The wrist band 40 is connected to the respective body element 10 and the battery pack holder 20, and locking segments are provided at the free ends of the wrist band 40 to allow the watch type portable radiotelephone of the present invention to be attached
15 easily to and detached from the wrist.

In the case where the battery pack 22 is mounted to the battery pack holder 20, the battery pack 22 is maintained in a locked state, and in the case where the battery pack 22 is unlocked from the battery pack holder 20, the battery pack 22 can be detached from the battery pack holder 20. In figure 1, an arrow ① indicates directions in which the battery pack 22 is locked to and unlocked from the battery pack holder 20, and an arrow in ② indicates directions in which a lock of the locking means 50 is moved.
25

The battery pack 22 is locked to and unlocked from the battery pack holder 20 while being moved along a straight path (in the directions indicated by the arrow ①). For this, a guide means 60 is provided to allow the 5 battery pack 22 to be locked to and unlocked from the battery pack holder 20 while being moved along the straight path.

The guide means 60 comprises a guide projection and a guide groove. The guide projection is formed in the 10 battery pack holder 20, and the guide groove is formed on a side face of the battery pack 22.

The watch type portable radiotelephone according to the present invention provides advantages in that since it can be worn around the wrist of the user, excellent 15 portability is accomplished. Also, since the battery pack holder 20 including the battery pack 22 is mechanically and electrically connected to the body element 10 by the hinge means 30, the watch type portable radiotelephone according to the present invention is advantageous in terms of the miniaturisation thereof. Moreover, because 20 the battery pack 22 can be repeatedly locked and unlocked to and from the battery pack holder 20, respectively, by the separate locking means 50, user convenience is ensured.

Also, by the fact that the battery pack holder 20 and the body element 10 are rotatably connected with each other by the hinge means 30 including the electrical connection means, the watch type portable radiotelephone according to the present invention can be easily worn around the wrist while having enhanced portability.

Figure 4 is an exploded perspective view of a battery pack holder in accordance with the preferred embodiment of the present invention. Figure 5 is an exploded perspective view partially illustrating a hinge part of a body element in accordance with the preferred embodiment of the present invention. Figure 6 is an exploded perspective view illustrating hinge means in accordance with the preferred embodiment of the present invention. Figure 7 is a partial perspective view illustrating a state wherein a flexible printed circuit in accordance with the preferred embodiment of the present invention is inserted into a centre hinge arm of the body element.

Referring to figures 4 to 8, the hinge means 30 according to the present invention includes as its components the battery pack holder 20, a lower cover 320 which is fastened to the outer surface of the bottom wall of the battery pack holder 20, and the body element 10 having the upper and lower case frames 110 and 112.

A pair of contact spring holders 210 are arranged at a side of the battery pack holder 20. The pair of contact spring holders 210 have four contact springs 211 which are brought into contact with four terminals of the battery pack 22, respectively, when the battery pack 22 is mounted to the battery pack holder 20. A flexible printed circuit (FPC) 212 is provided on outer surfaces of the pair of contact spring holders 210. One end of the flexible printed circuit 212 is electrically connected to the contact springs 211 by means of soldering. The pair of contact spring holders 210 are installed on a pair of seating surfaces 201, respectively, defined in a first supporting part 310 which is projectedly formed at the side of the battery pack holder 20.

A second supporting part 330 which has the same structure with the first supporting part 310 formed in the battery pack holder 20, is also formed in the body element 10. The hinge means 30 is constructed so that the first and second supporting parts 310 and 330 to couple them to each other.

A first hinge arm 311 and a second hinge arm 312 are formed on the first supporting part 310 of the battery pack holder 20 in a manner such that they are spaced apart from each other by a predetermined distance. The first and second hinge arms 311 and 312 are formed with hinge holes 311a and 312a, respectively, through which a hinge

shaft having a predetermined contour can pass.

A third hinge arm 321 is formed on a side of the lower cover 320 which is fastened to the outer surface of the bottom wall of the battery pack holder 20. The third hinge arm 321 is formed in a manner such that it is open at an inside portion thereof. The third hinge arm 321 functions to guide therethrough, toward the body element 10, the other end of the flexible printed circuit 212 which has one end fastened to the pair of contact spring holders 210. Also, the third hinge arm 321 is formed at a position in such a manner that it is brought into close contact at one end thereof with one end of the first hinge arm 311 of the battery pack holder 20, when the lower cover 320 is fastened to the battery pack holder 20. At both sides of the third hinge arm 321 of the lower cover 320, there is formed integrally a supporting part cover portion 322 which covers the first supporting part 310 of the battery pack holder 20. A pair of open portions 322a are formed in the supporting part cover portion 322 above the first and second hinge arms 311 and 312 thereby to prevent the supporting part cover portion 322 from being interfered with by the first and second hinge arms 311 and 312 when it is mounted to the battery pack holder 20.

A fourth hinge arm 331 and a fifth hinge arm 332 are projectedly formed at both ends of a second supporting part 330, respectively, which is arranged in the upper

case frame 110 of the body element 10 in a manner such that they are opposite each other. The fourth and fifth hinge arms 331 and 332 are formed with hinge holes 331a and 332a, respectively. A separate centre hinge arm 340 is disposed on the upper case frame 110 between the fourth and fifth hinge arms 331 and 332.

The centre hinge arm 340 has, as shown in figure 6, an inner hinge arm portion 341 which defines a hinge hole 341a and an outer housing 342 which defines an annular space 343 (see figure 7) around the inner hinge arm portion 341. The inner hinge arm portion 341 and the outer housing 343 are concentrically arranged while centring around the hinge hole 341a, and are formed integrally with each other. A first slit 345 through which the flexible printed circuit 212 passes, is formed in the outer housing 342 such that it extends in an axial direction. Also, a body element mounting part 344 having a pair of second slits 345 through which the flexible printed circuit 212 passes and a first seating groove 344a which is defined between the pair of second slits 345, is formed integrally with a side of the centre hinge arm 340.

A recessed mounting edge portion 110a is formed in the upper case frame 110 of the body element 10 in a manner such that the mounting edge portion 110a has a height which is smaller than that of the upper case frame 110 of the body element 10. The mounting edge portion

110a is fitted into the first seating groove 344a of the body element mounting part 344.

If the lower cover 320 which has the third hinge arm 321 formed therein is assembled to the outer surface of the bottom wall of the battery pack holder 20 by means of screws (not shown) etc., the third hinge arm 321 is brought into close contact at one end thereof with the one end of the first hinge arm 311 of the battery pack holder 20. Also, the supporting part cover portion 322 of the lower cover 320 covers the first support part 310 of the battery pack holder 20. At this time, the flexible printed circuit 212 is guided through the open portion of the third hinge arm 321.

To couple the battery pack holder 20 to which the lower cover 320 is mounted, to the body element 10, the first and second supporting parts 310 and 330 are mutually opposing. The second hinge arm 312 of the battery pack holder 20 is substantially closely fitted into a first slot 335 which is defined between the centre hinge arm 340 and the fifth hinge arm 332 of the upper case frame 110. Also, the first hinge arm 311 of the battery pack holder 20 and the third hinge arm 321 of the lower cover 320 which is brought into contact with the one end of the first hinge arm 311 are substantially closely fitted into a second slot 336 which is defined between the fourth hinge arm 331 and the centre hinge arm 340 of the upper

case frame 110 of the body element 10. In other words, all of the hinge arms are brought into close contact one with another in the order of the fourth hinge arm 331, first hinge arm 311, third hinge arm 321, centre hinge arm 5 340, second hinge arm 312 and fifth hinge arm 332. In addition, hinge holes of the respective hinge arms are aligned to allow the hinge shaft 350 to be inserted therein.

At this time, the other end of the flexible printed circuit 212 which is guided through the third hinge arm 321, as shown in figure 6, passes through the first slit 345 which is defined in the outer housing 342 of the centre hinge arm 340, and then, is routed along the annular space 343 which is defined between the inner hinge arm portion 341 and the outer housing 342 of the centre hinge arm 340. Thereafter, the flexible printed circuit 212 is introduced into the body element 10 after passing through the pairs of second slits 345 of the body element mounting part 344. The reason why the flexible printed circuit 212 is routed along the annular space 343 is to prevent the flexible printed circuit 212 from being tightly pulled when the battery pack holder 20 is pivoted relative to the body element 10 through a predetermined angle. Accordingly, the flexible printed circuit 212 is 10 15 20 25 routed in a direction in which the battery pack holder 20 is pivoted relative to the body element 10.

By inserting the hinge shaft 350 through the respective hinge holes which are formed in the respective hinge arms, the body element 10 and the battery pack holder 20 are coupled to each other. A threaded portion 350a is formed in a distal end of the hinge shaft 350. Therefore, after the hinge shaft 350 has passed through the hinge holes, by locking a hinge cap 351 to the threaded portion 350a of the hinge shaft 350, the assembling of the body element 10 and the battery pack holder 20 is completed.

As described above, because the body element 10 and the battery pack 22 are mounted in a state wherein they are separated from each other, the battery pack 22 is electrically connected to the board of the body element 10 by the separate connection means. Namely, the electrical connection means is provided between the body element 10 and the battery pack holder 20. In this connection, electrical contacting means is provided between the battery pack 22 and the battery pack holder 20, to allow them to be brought into contact with each other depending upon whether the battery pack 22 is locked to the battery pack holder 20 or not.

Figure 8 is an exploded perspective view illustrating connection means for battery pack terminals of the watch type portable radiotelephone in accordance with the preferred embodiment of the present invention.

Figure 9 is an exploded perspective view illustrating a construction of a terminal holder of a battery pack in accordance with the preferred embodiment of the present invention. Figure 10 is a perspective view illustrating a pair of contact spring holders to which four contact springs in accordance with the preferred embodiment of the present invention are mounted.

To constitute the electrical connection means between the battery pack 22 and the battery pack holder 20, according to the present invention, the battery pack 22 comprises a case 220 into which a plurality of battery cells (not shown) are embedded, a terminal holder 230 having four terminals 234 which are installed in a side wall 220a of the case 220, and a cover 240 which is secured to the case 220 after the plurality of battery cells and the terminal holder 230 are embedded into and installed in the case 220, respectively.

The side wall 220a of the case 220 is formed with a seating edge portion 221. The seating edge portion 221 is formed by the fact that a portion of the side wall 220a of the case 220 is cut away. The seating edge portion 221 allows the terminal holder 230 to be seated thereon. Three guide pieces 222 are formed at both left and right ends and at the centre of the seating edge portion 221 of the battery pack 22, respectively, in a manner such that they project upward. A pair of first stepped portions 233

are formed at both ends of the terminal holder 230, respectively, in such a manner that they can be tightly fitted between the three guide pieces 222 and the outer surface of the side wall 220a of the case 220 of the battery pack 22.

Referring to figure 9, two pairs of guide ribs 232 are formed at each of upper and lower portions of the terminal holder 230, and a pair of guide grooves 235 are formed at both sides of each terminal 234, respectively, which is installed to the terminal holder 230. Each pair of guide ribs 232 of the terminal holder 230 are tightly fitted into the pair of guide grooves 235 of each terminal 234, respectively. An inner surface of the terminal 234 which is coupled to the terminal holder 230 is electrically connected to the plurality of battery cells, and an outer surface of the terminal 234 is flush with the outer surface of the side wall 220a of the case 220.

The cover 240 is attached to an upper end of the case 220 by means of ultrasonic fusion welding thereby to achieve a waterproof structure.

Referring to figure 8, a pair of openings 200 are defined at positions which correspond to the two pairs of terminals 234 of the terminal holder 230, respectively, which are exposed to the outside through the side wall 220a of the case 220 of the battery pack 22. A pair of

seating surfaces 201 are defined at lower ends of the pair of openings 200, respectively. The pair of contact spring holders 210, to which four contact springs 211 are installed, are seated onto the pair of seating surfaces 201, respectively. The contact springs 211 are formed such that portions thereof project into the battery pack holder 20 to be brought into contact with the terminals 234 of the battery pack 22 which is mounted to the battery pack holder 20.

A pair of second seating grooves 201a having a predetermined depth are formed in a longitudinal direction at the sides of the pair of seating surfaces 201 of the battery pack holder 20, respectively. Referring to figure 10, ends of the pair of contact spring holders 210 are tightly fitted into the pair of second seating grooves 201a, respectively. A pair of second stepped portions 213 are formed at the ends of the pair of contact spring holders 210, respectively, as in the case of the terminal holder 230. Also, proximal ends of the contact springs 211 project toward the outer surfaces of the pair of contact spring holders 210, thereby to be connected to the other end of the flexible printed circuit 212 which in turn is electrically connected to the body element 10. As described above, the lower cover 320 which is formed with the pair of hinge projections for securing the wrist band 40, is fastened to the outer surface of the bottom wall of the battery pack holder 20.

Figure 11 is a partial cross-section view illustrating a state just before the battery pack in accordance with the preferred embodiment of the present invention is mounted to the battery pack holder. Figure 5 12 is a partial cross-section view illustrating another state wherein the battery pack in accordance with the preferred embodiment of the present invention is mounted in the battery pack holder.

If the battery pack 22 constructed as mentioned above is mounted to the battery pack holder 20, as shown in figures 11 and 12, the four terminals 234 which are exposed to the outside through the side wall 220a of the case 220 of the battery pack 22, are brought into contact with the four contact springs 211, portions of which project into the battery pack holder 20. At this time, the contact springs 211 which are mounted to the battery pack holder 20, are pressed by the terminals 234 of the battery pack 22 and withdraw backward creating a predetermined tension. As a result, the terminals 234 of the battery pack 22 and the contact springs 211 of the battery pack holder 20 are brought into close contact one with another.

Also, according to the present invention, locking means for locking to and unlocking from the battery pack 25 22 the battery pack holder 20, respectively, is provided.

Figure 13 is a perspective view illustrating the watch type portable radiotelephone from which the battery pack in accordance with the preferred embodiment of the present invention is dismounted. Figure 14 is a partial perspective view illustrating battery pack locking means in accordance with the preferred embodiment of the present invention.

As shown in figures 13 and 14, the locking means of the present invention is mounted to a desired place on the battery pack holder 20. The locking means occupies a portion of a lower face 251 and a portion of a side face 252 of the battery pack holder 20. The battery pack holder 20 is formed with a projection 253 for guiding a lock 51 of the locking means in the directions indicated by the arrow ② when the locking means is installed on the battery pack holder 20. As the locker 51 of the locking means is moved in the directions indicated by the arrow ②, the battery pack 22 can be locked to and unlocked from the battery pack holder 20, respectively.

Figure 15 is an exploded perspective view illustrating the battery pack locking means in accordance with the preferred embodiment of the present invention. The battery pack locking means according to the present invention comprises two lockers 51 and 52. One locker 51 is assembled to the battery pack holder 20 from bottom to

top, and the other locker, that is, a sub locker 52 is assembled to the battery pack holder 20 from top to bottom. The locker 51 and the sub locker 52 are coupled with each other by means of a screw S in a vertical direction, to be integrally moved with each other.

The battery pack holder 20 has a recess 255 which is formed on an inner surface of the bottom wall 254 of the battery pack holder 20. At least one guide slot 257 for guiding the movement of the locker 51 and the sub locker 52 is defined in the recess 255. A centre slot 256 is also formed to allow the locker 51 and the sub locker 52 to be inserted therein, thereby to guide the movement of the locker 51 and the sub locker 52. In the preferred embodiment of the present invention, two guide slots 257 are formed such that they are opposed to each other. The guide slots 257 function to guide the locker 51 and the sub locker 52 along the directions (indicated by the arrow ② of figure 14). Further, due to the fact that a stopper protrusion 258 is projectedly formed at a portion of the bottom wall 254 which defines the guide slot 257, when the locker 51 is moved forward and rearward along the straight path, the locker 51 resists impact which is applied to the body element 10.

The locker 51 has a locking boss 511 for receiving therein the screw S, and a pair of guide projections 512 are projectedly formed at both sides of the locking boss

511. The pair of guide projections 512 are arranged such
that they are symmetrical. In the case where the locker
51 is mounted to the battery pack holder 20, a protrusion
513 serving as the reference of a precise assembly
position between the locker 51 and the battery pack holder
20, projects upward. Additionally, each of the pair of
guide projections 512 is formed with a stopper protrusion
514 for tightening the movement of the locker 51, so that
the movement of the locker 51 is restricted by the battery
10 pack holder 20.

The sub locker 52 is made of metal. One end 521 of
the sub locker 52 is formed with a hole 523 through which
the protrusion 513 passes, a middle portion of the sub
locker 52 is formed with a hole 522 through which the
15 screw S passes, and the other end, that is, a locking end
524 of the sub locker 52 is bent twice. The other end of
the sub locker 52 serves as a segment which is engaged
into and disengaged from a locking groove 226 (see figure
16) which in turn is defined in the battery pack 22. At
20 the other end, that is, the locking end 524 of the sub
locker 52, the battery pack 22 can be locked to the
battery pack holder 20.

As a result, as the locker 51 is moved, the sub
locker 52 is moved integrally with the locker 51.
25 Accordingly, if the locker 51 is forcibly pushed toward
the battery pack 22, the battery pack 22 is maintained in

a state wherein it is locked to the battery pack holder 20, that is, the locking end 524 of the sub locker 52 is engaged into the locking groove 226. On the contrary, if the locker 51 is forcibly pulled away from the battery pack 22, the locking end 524 of the sub locker 52 is disengaged from the locking groove 226 (see figure 16), that is, the battery pack 22 is unlocked from the battery pack holder 20.

As shown in figure 16, in order to allow the battery pack 22 to be locked and unlocked from the battery pack holder 20, respectively, the side end of the battery pack 22 is formed with a guide projection 225 and the locking groove 226. The guide projection 225 is provided for allowing the battery pack 22 to be locked and unlocked to and from the battery pack holder 20, respectively, while being moved along the straight path, and the locking end 254 of the sub locker 52 is engaged into and disengaged from the locking groove 226.

As shown in figure 17, after the battery pack 20 (not shown in figure 17) is fitted into the battery pack holder 20 in a direction indicated by an arrow (a), if the locker 51 is pushed in a direction indicated by an arrow (b), the locking end 524 is engaged into the locking groove 226 to lock the battery pack 22 to the battery pack holder 20. On the other hand, as shown in figure 18, if the locking end 524 is disengaged from the locking groove

226 in a direction indicated by an arrow (d) by pulling the locker 51 in a direction indicated by an arrow (c), the battery pack 22 is unlocked from the battery pack holder 20.

5 Accordingly, the watch type portable radiotelephone according to the present invention provides advantages in that since the battery pack 20 can be repeatedly locked to and unlocked from the battery pack holder 20 using the separate locking means 50 thereby to be recharged, user
10 convenience is ensured. At this time, the stopper protrusions 258 and 514 cooperate with each other to tighten and restrict the movement of the locker 51.

The locking means for the battery pack 22 can also be constructed as described below.

15 Figure 19 is an exploded perspective view illustrating battery pack locking means of a watch type portable radiotelephone in accordance with a second preferred embodiment of the present invention. Figures 20 is a perspective view illustrating a battery pack holder
20 to which the battery pack locking means in accordance with the second preferred embodiment of the present invention is installed.

Figure 21 is an exploded perspective view illustrating a lower surface of the battery pack holder to

which the battery pack locking means in accordance with the second preferred embodiment of the present invention is installed. Figure 22 is a perspective view illustrating the lower surface of the battery pack holder to which the battery pack locking means in accordance with the second preferred embodiment of the present invention is installed.

As shown in figure 19 through 22, the battery pack locking means according to this embodiment of the present invention comprises a pinion gear 530, at least one locking member 540, a lever 550 and a fixing pin 560. The pinion gear 530 is rotatably seated at a proper position onto the inner surface of the bottom wall 254 of the battery pack holder 20. At least one locking member 540 has a rack gear 541 and a locking tongue 542 which are integral with each other. The rack gear 541 extends from the outside into the battery pack holder 20 through a side wall 270 of the battery pack holder 20 and is meshed with the pinion gear 530 to be moved forwards and backwards. The locking tongue 542 is bent at one end of the rack gear 541 and also extends from the outside into the battery pack holder 20 through the side wall 270 of the battery pack holder 20. The lever 550 is disposed on the outer surface of the bottom wall 254 of the battery pack holder 20 and has a knob portion 551 for rotating the pinion gear 530 in a predetermined direction. The fixing pin 560 is secured to a boss 531 which is formed on a lower surface

of the pinion gear 530 after passing through the lever 550, for enabling the pinion gear 530 to be rotated in response to actuation of the lever 550.

As described above, the locking member 540 has the
5 rack gear 541 which is formed with a plurality of teeth,
and the locking tongue 542 which is bent twice at one end
of the rack gear 541 in one direction.

A pinion gear seating surface 261 on which the
pinion gear 530 is to be seated, is formed on the inner
10 surface of the bottom wall 254 of the battery pack holder
20 on which the battery pack 22 is positioned. The lower
surface of the pinion gear 530 is formed with the boss 531
which has a hole 531a. The boss 531 is inserted through a
boss insertion hole 261a which is defined at a centre
15 portion of the pinion gear seating surface 261. Also, a
rack gear guide surface 262 along which the rack gear 541
of the locking member 540 is to be guided, is formed at a
side of the pinion gear seating surface 261.

The side wall 270 of the battery pack holder 20 is
20 formed with a guide hole 271 through which the rack gear
541 of the locking member 540 passes to extend into the
battery pack holder 20. Also, a through hole 272 is
formed above the guide hole 271 in the side wall 270 of
the battery pack holder 20. The locking tongue 542 of the
25 locking member 540 passes through the through hole 272 to

project into the inside of the battery pack holder 20.

The pinion gear seating surface 261 and the rack gear guide surface 262 are formed such that they are lower than the inner surface of the bottom wall 254 of the battery pack holder 20 and the pinion gear 530 and the rack gear 541 of the locking member 540 are flush with the inner surface of the bottom wall 254 of the battery pack holder 20.

Referring to figures 19 and there are shown a perspective view illustrating a locking member of the battery pack locking means in accordance with the second preferred embodiment of the present invention. A guide pin 543 is projectedly formed on a lower surface of the rack gear 541 of the locking member 540. A guide slit 263 having a predetermined length is defined in the rack gear guide surface 262 of the battery pack holder 20. The guide pin 543 is inserted into the guide slit 263 to be guided therealong. In order to prevent the guide pin 543 from being released from the guide slit 263 when the rack gear 541 of the locking member 540 is guided along the guide slit 263, a circular release preventing piece 543a is formed at a distal end of the guide pin 543 of the rack gear 541, and a circular hole 263a through which the release preventing piece 543a passes is defined at one end of the guide slit 263. The circular hole 263a is formed in a manner such that a diameter thereof is larger than a

width of the guide slit 263. Therefore, when the guide pin 543 is guided along the guide slit 263 after the release preventing piece 543a of the guide pin 543 of the rack gear 541 is inserted through the circular hole 263a of the guide slit 263, the locking member 540 is prevented from being released.

Figure 24 is an operational view illustrating operation of a pinion gear and a pair of locking members in accordance with the second preferred embodiment of the present invention. In accordance with the present invention, a pair of locking members 540 can be disposed such that they are opposite to each other while being centred on the pinion gear 530. That is to say, if the pinion gear 530 is rotated in a clockwise direction about its axis, the pair of locking members 540 are moved linearly outwards.

The lever 550 which can rotate the pinion gear 530, is disposed on the outer surface of the bottom wall 254 of the battery pack holder 20. The lever 550 has a circular configuration, and an upper surface of the lever 550 which faces the outer surface of the bottom wall 254 of the battery pack holder 20, is formed as a depressed surface 552 which has a boss 553. A fixing pin passing hole 553a is defined in the boss 553.

Figure 25 is a partial cross-section view

illustrating a state wherein the pinion gear and a lever in accordance with the second preferred embodiment of the present invention are installed on the battery pack holder. After the boss 531 of the pinion gear 530, which is inserted through the boss insertion hole 261a defined in the bottom wall 254 of the battery pack holder 20, and the boss 553 of the lever 550 which is disposed on the outer surface of the bottom wall 254 of the battery pack holder 20, are positioned such that they are aligned, the fixing pin 560 is inserted into the boss 531 of the pinion gear 530 through the boss 553 of the lever 550. Namely, after passing through the fixing pin passing hole 553a, the fixing pin 560 is screwed into the hole 531a which is defined in the boss 531 of the pinion gear 530. Accordingly, the pinion gear 530 is structured such that it is integrally rotated by the rotation of the lever 550.

At this time, in order to maintain a state wherein the locking tongue 542 of each locking member 540 is always biased to project into the battery pack holder 20, elastic means is intervened between the depressed surface 552 of the lever 550 and the outer surface of the bottom wall 254 of the battery pack holder 20. As the elastic means, a torsion spring 570 having a fixed end 571 and a free end 572 is used. In other words, the fixed end 571 of the torsion spring 570 is fixed in such a manner that it is supported by an engaging projection 264 which is projectedly formed on the outer surface of the bottom wall

254 of the battery pack holder 20, and the free end 572 of the torsion spring 570 is arranged in such a manner that it is supported by another engaging projection 554 which is formed on the depressed surface 552 of the lever 550.

5 The torsion spring 570 is installed to have a predetermined tension in a state wherein both ends 571 and 572 thereof are supported by the engaging projections 264 and 554, respectively.

Further, both sides of the battery pack 22 which is
10 detachably mounted to the battery pack holder 20, are formed with a pair of engaging grooves 22a into which the locking tongues 542 of the pair of locking members 540 projecting into the battery pack holder 20 are engaged, respectively.

15 Figure 26 is an operational view illustrating a state wherein the pair of locking members of the battery pack locking means in accordance with the second preferred embodiment of the present invention are in a locking position. Figure 27 is an operational view illustrating
20 another state wherein the pair of locking members of the battery pack locking means in accordance with the second preferred embodiment of the present invention are in an unlocking position.

In the locking members 540 according to this
25 embodiment of the present invention, as shown in figure

26, portions of the locking tongues 542 project into the battery pack holder 20. This state is held due to the fact that the free end 572 of the torsion spring 570 having the predetermined tension pushes the engaging projection 554 of the lever 550, with the fixed end 571 of the torsion spring 570 supported by the engaging projection 264 of the battery pack holder 20.

If the knob portion 551 of the lever 550 is rotated by a predetermined angle in a clockwise direction so as to mount the battery pack 22 (not shown in figures 26 and 10 27), the engaging projection 554 of the lever 550 lowers the free end 572 of the torsion spring 570 toward the fixed end 571 of the torsion spring 570 which is supported by the engaging projection 264 of the battery pack holder 15 20 (see figure 27). At this time, the torsion spring 570 has a tension which is larger than the predetermined tension in the case of figure 26.

According to this, the pinion gear 530 is rotated, and the pair of locking members 540 which are meshed with 20 the pinion gear 530, are also rotated in a direction indicated by an arrow depicted in figure 27. That is to say, the rotating movement of the pinion gear 530 due to the manipulation of the lever 550 is changed to linear movements of the locking members 540 having the rack gears 25 541. At this time, it is preferred that the lever 550 is rotated by 24°.

In this state, after the battery pack 22 is fitted into the battery pack holder 20, if the knob portion 551 of lever 550 is released, the locking tongues 542 of the locking members 540 are returned to their original positions as shown in figure 26 by the elastic force of the torsion spring 570. Accordingly, the locking tongues 542 are engaged into the engaging grooves 22a, respectively, which are formed at the side surfaces of the battery pack 22, thereby accomplishing locking of the battery pack 22.

Figure 28 is a perspective view illustrating a watch type portable radiotelephone in accordance with a third preferred embodiment of the present invention. Figure 29 is a front view illustrating the watch type portable radiotelephone in accordance with the third preferred embodiment of the present invention. Figure 30 is a side view illustrating the watch type portable radiotelephone in accordance with the third preferred embodiment of the present invention.

Referring to figures 28 to 30, in the watch type portable radiotelephone according to the third embodiment of the present invention, a touch pen is used as data input means, and a touch panel 107 which is mounted to the body element is used as data output means which responds to a data input operation by the touch pen. Since other

portions except the data input means and data output means have the same constructions with those of the first or second embodiments, further explanations thereof will be omitted.

5 In the case that the touch panel is used as the data output means, while it is explained that the data input means is limited to the touch pen, the data input means needs not to be limited to the touch pen, and data can be input using a mechanism which has the same functionality
10 with the touch pen, or the finger, as occasion demands.

As described above, the watch type portable radiotelephone according to the present invention provides advantages in that portability is enhanced due to its compactness and lightweight, whereby user convenience is ensured. Furthermore, since a battery pack is constructed such that it can be easily locked to and unlocked from a battery pack holder, user convenience is further elevated. Moreover, because terminal connection means and hinge means are constructed such that they have waterproof structures, waterproofs is ensured when the watch type
20 portable radiotelephone is worn around the wrist.

While this invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, it is
25

intended to cover various modifications within the spirit and scope of the appended claims.

CLAIMS

1. A portable radiotelephone comprising:

a body element including upper and lower case

5 frames;

a battery pack holder for a battery pack for supplying power to the body element;

locking means for locking and unlocking the battery pack to and from the battery pack holder, 10 respectively;

hinge means for rotatably connecting the body element and the battery pack holder with each other; and

a band connected to the body element and the 15 battery pack holder for enabling the portable radiotelephone to be worn around a wrist of a wearer; wherein the locking means comprises:

at least one guide slot formed in the bottom wall of the battery pack holder;

a locker assembled to the battery pack holder from bottom to top, the locker having at least one guide projection which is inserted into the guide slot, the locker being guided along the guide slot thereby to be moved along a straight path; and

a sub locker assembled to the battery pack holder from top to bottom and locked to the locker by means of a screw to be integrally moved herewith, the sub locker having a locking end which can be

engaged into a locking groove defined in the battery pack.

2. A portable radiotelephone as claimed in claim 1,

5 wherein in:

the body element includes data input means, an LCD unit capable of outputting data in response to a data input operation of the data input means, an antenna unit electrically connected to a receiver and a transmitter, a speaker unit, and a microphone unit; and

connection means for electrically connecting the battery pack to the body element.

15 3. A portable radiotelephone as claimed in claim 2, wherein the data input means comprises either one or both of at least one key and a voice recognition unit.

20 4. A portable radiotelephone as claimed in any of claims 1 to 3, wherein guide means is additionally provided to the locking means for allowing the battery pack to be locked to and unlocked from the battery pack holder while the battery pack is guided to be moved 25 along a straight path.

5. A portable radiotelephone as claimed in any of claims 1 to 4, wherein a lower cover having a predetermined

contour is fastened to an outer surface of a bottom wall of the battery pack holder by means of screws.

6. A portable radiotelephone as claimed in any of claims
5 1 to 5, wherein the hinge means comprises:

first and second circular hinge arms projectedly formed in a first supporting part which is disposed at a side of the battery pack holder, in such a manner that they are spaced apart by a predetermined distance, each of the first and second hinge arms having a hinge hole;

a third hinge arm formed at a side of a lower cover, coupled to an outer surface of a bottom wall of the battery pack holder, and opened at an inside thereof in a manner such that it guides therethrough, toward the body element, a free end of a flexible printed circuit, which has another end electrically connected to the battery pack holder; the third hinge arm being brought into contact at one end thereof with one end of the first hinge arm;

fourth and fifth hinge arms formed in a second supporting part which is disposed at a side of an upper case frame of the body element, in such a manner that they are brought into contact at their ends with ends of the first and second hinge arms, respectively, each of the fourth and fifth hinge arms having a hinge hole;

a centre hinge arm installed to the upper case

frame between the fourth and fifth hinge arms and having a first slit through which the free end of the flexible printed circuit passes, the centre hinge arm having a hinge hole; and

5 a hinge shaft passing through the third hinge arm and through the hinge holes which are formed in the first, second, fourth and fifth hinge arms and in the centre hinge arm, the hinge shaft being locked by a hinge cap thereby to be prevented from
10 being released.

7. A portable radiotelephone as claimed in claim 6, wherein the second hinge arm of the battery pack holder is closely fitted into a first slot which is defined between the centre hinge arm and the fifth hinge arm of the upper case frame of the body element.
15

8. A portable radiotelephone as claimed in either of claims 6 or 7, wherein the first hinge arm of the battery pack holder and the third hinge arm of the lower cover which is brought into contact at its one end with the one end of the first hinge arm, are closely fitted into a second slot defined between the fourth hinge arm and the centre hinge arm of the upper case frame of the body element.
20
25

9. A portable radiotelephone as claimed in any of

claims 6 to 8, wherein a body element mounting part having a pair of second slits through which the flexible printed circuit passes and a first seating groove which is defined between the pair of second slits, is formed integrally with a side of the centre hinge arm; and a mounting edge portion, which is formed in the upper case frame in a manner such that the mounting edge portion has a smaller height than that of the upper case frame of the body element, is fitted into the first seating groove of the body element mounting part.

10. A portable radiotelephone as claimed in any of claims 6 to 9, wherein the centre hinge arm comprises an inner hinge arm portion which defines the hinge hole, and an outer housing which defines an annular space around the inner hinge arm portion, the inner hinge arm portion and the outer housing being concentrically arranged while centring around the hinge hole.
15. A portable radiotelephone as claimed in claim 10, wherein the flexible printed circuit extends toward the body element while being routed along the annular space which is defined between the inner hinge arm portion and the outer housing of the centre hinge arm.
20. A portable radiotelephone as claimed in claim 10, wherein the flexible printed circuit extends toward the body element while being routed along the annular space which is defined between the inner hinge arm portion and the outer housing of the centre hinge arm.
25. A portable radiotelephone as claimed in claim 10, wherein the flexible printed circuit extends toward the body element while being routed along the annular space which is defined between the inner hinge arm portion and the outer housing of the centre hinge arm.

12. A portable radiotelephone as claimed in claim 11, wherein the flexible printed circuit is routed in a direction where the battery pack holder is pivoted relative to the body element.
- 5 13. A portable radiotelephone as claimed in any of claims 2 to 22, wherein the connection means comprises:
- a seating edge portion formed in a side wall of the battery pack in a manner such that it opens a portion of the side wall of the battery pack;
- 10 15 a terminal holder installed in the seating edge portion in a manner such that it is flush with an outer surface of the side wall of the battery pack, the terminal holder having a plurality of terminals;
- a pair of openings defined at positions which correspond to the plurality of terminals of the terminal holder at the side of the battery pack holder; and
- 20 a pair of contact spring holders installed in the pair of openings, respectively, and having a plurality of contact springs which project inside the battery pack holder through the pair of openings.
- 25 14. A portable radiotelephone as claimed in claim 13, wherein two pairs of guide ribs are formed at each

of upper and lower portions of the terminal holder; a pair of guide grooves are formed at both sides of each terminal, respectively, which is installed to the terminal holder; and each pair of guide ribs of the terminal holder are tightly fitted into the pair of guide grooves of each terminal.

5 16. A portable radiotelephone as claimed in either of claims 13 or 14, wherein guide pieces are formed at both ends and at a centre of the seating edge portion of the battery pack, respectively, in a manner such that they project upward while having a thickness which is smaller than that of the side wall of the battery pack; and a pair of stepped portions are formed at both ends of the terminal holder, respectively, in such a manner that the pair of stepped portions of the terminal holder form an interference fit between the guide pieces and the outer surface of the side wall of the battery pack.

10 16. A portable radiotelephone as claimed in any of claims 13 to 15, wherein a pair of second seating grooves having a predetermined depth are formed in a longitudinal direction at the sides of the pair of openings of the battery pack holder, respectively, in a manner such that ends of the pair of contact spring holders can be tightly fitted into the pair of second seating grooves, respectively.

17. A portable radiotelephone as claimed in claim 16
wherein the sub locker is made of metal.

.5 18. A portable radiotelephone as claimed in either of
claims 11 to 17, wherein both the locker and the sub
locker are formed with a stopper protrusion.

10 19. A portable radiotelephone as claimed in any of
claims 11 to 18, wherein the locking means
comprises:

a pinion gear rotatably seated onto an inner
surface of the bottom wall of the battery pack
holder;

15 at least one locking member having a rack gear
and a locking tongue which are integrated with each
other, the rack gear extending from the outside into
the battery pack holder through a side wall of the
battery pack holder and being meshed with the pinion
gear to be moved forward and rearward, the locking
tongue being bent at one end of the rack gear and
also extending from the outside into the battery
pack holder through the side wall of the battery
pack holder;

a lever disposed on the outer surface of the
bottom wall of the battery pack holder, the lever
having a knob portion for rotating the pinion gear in
a predetermined direction;

a fixing pin, secured to a boss formed on a lower surface of the pinion gear after passing through the lever, for integrally rotating the pinion gear in a response to an operation of the lever; and

the battery pack having an engaging groove which is formed on a side surface thereof, the locking tongue of the locking member, which selectively projects into the battery pack holder by the rotation of pinion gear, being engaged into the engaging groove of the battery pack.

20. A portable radiotelephone as claimed in claim 19, wherein two locking members are installed in such a manner that they are oppositely positioned to each other at both sides of the pinion gear, respectively.
21. A portable radiotelephone as claimed in either of claims 19 to 20, wherein the pinion gear and the rack gear of the locking member are seated onto a pinion gear seating surface and a rack gear guide surface, respectively, which are formed lower than the inner surface of the bottom wall of the battery pack holder, thereby to be flushed with the inner surface of the bottom wall of the battery pack holder.
22. A portable radiotelephone as claimed in any of claims 19 to 21, wherein a guide pin is projectedly formed on a lower surface of the rack gear of the locking

member; and a guide slit of a predetermined length, in which the guide pin is inserted to be guided along the guide slit, is defined in the rack gear guide surface of the battery pack holder.

23. A portable radiotelephone as claimed in claim 22, wherein a release preventing piece, having a diameter which is larger than that of the guide pin, is formed at a distal end of the guide pin; and a circular hole having a diameter which is larger than a width of the guide slit, is defined at one end of the guide slit to allow the release preventing piece to be inserted therein.
- 5
24. A portable radiotelephone as claimed in any of claims 19 to 23, wherein elastic means for maintaining the projected state of the locking tongue of the locking member into the battery pack holder is provided to the lever.
- 10
25. A portable radiotelephone as claimed in claim 24, wherein the elastic means comprises a torsion spring which is installed in a manner such that both ends thereof can be supported with a predetermined tension by a pair of engaging projections which are formed on the outer surface of the bottom wall of the battery pack holder and a surface of the lever facing the battery pack holder, respectively.
- 15
- 20

26. A portable radiotelephone as claimed in any of claims 19 to 25, wherein, the pinion gear and the locking member having the rack gear are arranged in a manner such that, when the lever is rotated by 24°, the locking tongue of the locking member is disengaged from the engaging groove of the battery pack.
- 5
27. A portable radiotelephone as claimed in any of claims 11 to 26 comprising:
- 10 data input means; and
 a body element including a touch panel capable of outputting data in response to a data input operation for the data input means, an antenna unit electrically connected to a receiver and a transmitter, a speaker unit, and a microphone unit.
- 15
29. A portable radiotelephone as claimed in claim 27, wherein the data input means comprises either one or both of a touch pen or a voice recognition unit.
- 20
30. A portable radiotelephone substantially as described herein with reference to and/or as illustrated in the accompanying drawings.



Application No: GB 0121352.9
Claims searched: All

Examiner: Rowland Hunt
Date of search: 7 November 2001

Patents Act 1977

Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): H3Q (QACA, QACX); H4J (JAAB, JK)

Int Cl (Ed.7): A44C 5/00; H04B 1/08, 1/38; H04M 1/02, 1/03, 1/21, 1/62, 1/72

Other: Online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	WO 98/27702 A2 (GHASSABIAN)	
A	WO 95/35622 A1 (MICROTALK)	

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